ARMY ORDNANCE

VOL. XIII, No. 75 NOVEMBER-DECEMBER, 1932

The Ordnance Record for 1932

Maj. Gen. Samuel Hof

Our New Pack Artillery

E. C. Goebert

The Reduction of Armament

Charles G. Mettler

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Priorities for the Nation in Arms

C. B. Ross

Our Munitions Procurement Policy

An Editorial

A BIMONTHLY REVIEW OF AMERICAN MUNITIONS
PUBLISHED BY THE ARMY ORDNANCE ASSOCIATION, WASHINGTON, D. C.

Combat Car T-3—Accepted after Thorough tests by the Ordnance Department for Service in the U. S. Army

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ARMY ORDNANCE

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Founded 1920

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"Certain patriotic citizens have realized the importance of adequate industrial preparation and have voluntarily organized to assist in this work. The Army Ordnance Association comprises such a group, upon which the War Department leans heavily in carrying on the many activities incident to this type of preparation."

Frederick H. Payne, The Assistant Secretary of War.

The Army Ordnance Association

THE Army Ordnance Association is a national organization of American citizens pledged to industrial preparedness for war as our nation's strongest guarantee of peace.

The Association endeavors to keep alive an interest in and knowledge of the design, production and maintenance of munitions. Other than a few manufacturing arsenals—six in all—there is no peace-time industry for the production of ordnance. Should war unhappily come again, industrial America will be called upon to produce munitions in great quantity and of intricate and unusual design. In an emergency time will not permit careful study or long preparation for the production of munitions. The problem is one of vital concern.

THE Army Ordnance Association believes that the solution of this problem, based on experience, lies in an active organization at all times coöperating with the Government. The principal objective of the Association is an active membership of American citizens, on whom the duty of design and production of munitions will fall in war, who will have an accurate and authentic knowledge of the complex requirements of ordnance. "Peace insurance" in this form is the foremost aim of the Army Ordnance Association.

The Association is purely patriotic; it has no commercial interests, no political alliances, and no religious affiliations. It is not operated for profit: its income is expended in furthering its aims. Its officers and directors serve without remuneration.

ARMY ORDNANCE, the journal of the Association, is published solely for the purpose of disseminating information on the progress of our munitions developments so that American industry may at all times know its responsibilities to the common defense.

The objectives of the Association as set forth in its Constitution are:

To assist in effecting industrial preparedness for war as being one of the nation's strongest guarantees of peace;

To keep available the highly specialized knowledge necessary for arming the manhood of the nation by stimulating interest in the design and production of ordnance material;

To promote mutual understanding and to effect cooperation with American scientists, inventors, engineers and manufacturers in civil life and the regular and reserve officers of the Ordnance Department.

To provide, when required, the services of competent committees to investigate and report upon special ordnance subjects;

To assist in developing and maintaining an efficient personnel, both commissioned and enlisted, for the units required for Ordnance Field Service in the event of an emergency;

To commemorate the services rendered by the industry of the nation and by the officers and civilian employees of the Ordnance Department in the wars in which the United States has been engaged.

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Philip H. Gadsden

Recently Appointed Chief of the Philadelphia Ordnance District

ARMY ORDNANCE

VOL. XIII NOVEMBER-DECEMBER, 1932 No. 75

The Ordnance Record for 1932

The Progress of American Munitions During the Past Year

By Maj. Gen. Samuel Hof*

I AM particularly pleased to have the opportunity to place before readers of ARMY ORDNANCE the following resumé of the activities of the Ordnance Department during the fiscal year ended June 30, 1932. While my annual report is rendered at greater length to the Secretary of War, the following extracts gives an indication of the many accomplishments of the department during this period. I know that members of the Army Ordnance Association have an especial interest in the progress of ordnance and because of this interest I feel that this means of acquainting them with the performance record is both advisable and advantageous.

First let me say a word on industrial planning. The department continues to have the support and able assistance of industrial leaders who are the chiefs of the procurement districts. The districts have been particularly active in reporting existing production capacity, as determined by the plant surveys or abbreviated descriptions of manufacture, which has facilitated the preparation of new commodity plans. The use of the district offices to assist arsenals in inspection, and in submitting recommendations for changes in designs and production methods, has been somewhat increased.

Under the provisions of the Act of June 1, 1926, commonly called the Exchange Act, whereby the Secretary of War is authorized to exchange deteriorated or unserviceable ammunition for ammunition or components thereof in condition for immediate use, the department has received during the fiscal year approximately 128,000 pounds of new FNH smokeless powder. This powder has been used as part of the requirement for replacing deteriorated charges in the 75-mm. ammunition undergoing renovation.

In addition it has been possible to obtain a considerable quantity of brass fuze forgings and other components under the provisions of the Exchange Act in return for copper and brass recovered from worn-out cartridge cases and from the process of breaking down unserviceable ammunition.

Ordnance matériel of an original cost of $27,074,830.00 has been declared surplus by the Secretary of War and authorized for disposal. A study was made of all obsolete and condemned ordnance on hand at ordnance establishments, with a view to determining which items should be retained for future military use. As a result of this study, obsolete and condemned ordnance of an original cost of approximately $6,300,000.00 was disposed of, thereby making available valuable storage space which is needed to house standard equipment. $713,590.00 were expended during the past fiscal year by ordnance officers of departments, corps areas and exempted stations in the maintenance of ordnance matériel in the hands of the using arms and services. The servicing of matériel in the field was performed under the supervision of field agencies by a permanent staff of qualified technicians equipped with general and special tools and gauges for this purpose. Facilities of the various arsenals and other Ordnance establishments were utilized in effecting repairs which could not be satisfactorily or economically accomplished in the field.

Ordnance matériel in the hands of the National Guard was maintained under the supervision of corps area and department ordnance officers. Standards for and methods of maintenance were the same as those prescribed for matériel in the hands of regular Army troops. Funds to cover this maintenance, with the exception of alterations, were provided by the Militia Bureau. The cost of alteration of matériel in the hands of the National Guard was charged to regular Army appropriations and is included in the amount mentioned above.

Close supervision in the interest of economy was exercised in the procurement of spare parts, but orders were placed in sufficient quantities, based on anticipated requirements, to permit economical production.

Matériel in storage was inspected at regular intervals and remedial action taken when indicated, to insure continued serviceability in storage. $226,644.00 was expended for this purpose.

The following items were procured during the fiscal year: *Completed:* 17 3-inch antiaircraft mobile guns and carriages; 3 tanks, convertible, T3; 21 sound locators; 6 instrument trailers; 3 directors and transmission systems; 36 prime movers for antiaircraft artillery; 448 machine gun wheeled mounts. *Under manufacturer:* 14 3-inch antiaircraft mobile guns and carriages (to be completed January, 1933); 3 directors and transmission systems (to be completed in December, 1932); 11 sound locators (completed in September, 1932); 80 caliber .30 semiautomatic rifles (to be completed March 1, 1933); 226 caliber .30 aircraft machine guns (to be completed in January, 1933).

UNDER the heading of research and development the following will be of interest. The development of demolition bombs is, at present, principally a matter of ascertaining the most suitable method of manufacture from the standpoint of economy and assurance of supply in emergency, with due regard to effectiveness and method of employment of the bombs. Present standard demolition bombs, except the 2000-lb. size, are streamlined in shape and welded circumferentially. Recent experience has shown that cylindrical bombs are as stable as the streamlined type and have the advantages of ease of manufacture, reduced cost and high rate of production by processes commonly used in industry.

Demolition bomb bodies have been manufactured of the so-called one-piece type, from cupped plate, pierced billets, or tubing, and of the built-up type of welding tubing to forgings.

*Chief of Ordnance, U. S. Army.

Proving ground tests indicate the superiority of the one-piece bomb body, and further investigation is being made to determine whether built-up bombs made by welding may not also be acceptable. If so, utilization can be made of the great capacity of the modern welding industry.

Efforts to improve powder compositions so as to eliminate flash in the major caliber weapons are being continued. A plant has been installed at Picatinny Arsenal for the reworking of surplus and obsolete smokeless powder into new powder, and experimental lots of reworked powder are being subjected to periodic tests.

Laboratory studies have indicated that it is possible to prepare mercury fulminate of greatly improved purity by the recrystallization of the commercial product, and that the recrystallized explosive is much less subject to deterioration under adverse storage conditions. It is, therefore, hoped that it may be found feasible greatly to increase the serviceable life of the detonators in high explosive ammunition.

Experimental work on various types of small arms ammunition has been continued during the year.

An extensive program for the investigation of noncorrosive primer compositions has been conducted during the past several years with very promising results. All the ingredients used in foreign and domestic commercial primers, as well as other compounds which seemed to indicate promise, have been tested. Noncorrosive primers are now specified in the purchase of caliber .22 and caliber .30 Model 1898 ammunition. Limited quantities of caliber .30 ammunition containing the noncorrosive primer have been manufactured and are undergoing surveillance tests.

Continuing experimental work is being done on metal components of small arms ammunition. The use of alloys as a substitute for cartridge brass and cartridge clips with a view to saving weight, has been investigated. Results indicate that these alloys are satisfactory for the clips but so far their suitability for cartridge cases has not been definitely demonstrated.

A CALIBER .22 rifle, of a model closely resembling the Springfield in size, shape and operation, has been used in the Army for several years with great success. The advantage of the caliber .22 rifle is that its use of very cheap ammunition enables markmanship training to be accomplished at a large monetary saving over what it would cost if the high powered ammunition were used. Several years' experience with these rifles showed that, with the present basis of issue which subjects them to a very large amount of use, the cost of up-keep was high. During the year an improved design of caliber .22 rifle has been worked out which will greatly increase its ruggedness and durability and will effect large economies through reduced cost of upkeep and repair. Five experimental caliber .22 M2 rifles were manufactured and tested. The test indicated that the change would accomplish the purpose intended and future lots of caliber .22 rifles manufactured for the service will be of the improved type.

A caliber .22 pistol on the frame of the caliber .45 Government automatic is now under commercial sale. Fifteen of these have been obtained for test by the Infantry, Cavalry and Field Artillery to determine whether or not their use will result in improved training in pistol practice at a reduced cost of ammunition.

Experiments have been made with bakelite grips for automatic pistols. These grips can be molded very rapidly and large quantity production can easily be obtained in case of emergency. Experiments have also been made with die-cast aluminum grips artificially colored to resemble walnut. These aluminum and bakelite grips show promise of increased production at decreased cost.

During the year a caliber .30 semiautomatic rifle, following the same general design as the caliber .276 Garand semiautomatic rifle, was completed at Springfield Armory and passed a successful ordnance test at Aberdeen Proving Ground. As a result of the recommendation of the War Department Semiautomatic Rifle Board, and subsequent action thereon by the War Department, the Ordnance Department has undertaken the manufacture of eighty caliber .30 Garand semiautomatic rifles which will be finished about April, 1933, after which they will be given a prolonged test in the hands of troops to determine whether or not this type of rifle shall be finally adopted for the rearmament of the Army.

Up to the present time no suitable system of mounting machine guns on caissons, trucks or other vehicles has been developed. For the protection of trains against attack by aircraft, it is essential that some method be provided of mounting machine guns on caissons or other artillery vehicles and on motor trucks. A design has been prepared for a combination machine gun mount which can be attached to any type of vehicle for antiaircraft use while the vehicle is in motion or standing still. This tripod is also adapted to removal from the vehicle and use on the ground the same as an ordinary tripod.

Four units of 81-mm. mortar matériel (Stokes-Brandt) were obtained from French sources and have been tested by the Field Artillery, Infantry and Cavalry, and at the Aberdeen Proving Ground. The reports of tests are very favorable. This weapon is a development of the 3-inch Stokes trench mortar with which the service is equipped. Considerable improvement has been made in both range and accuracy.

About 160 3-inch antiaircraft gun matériel, M 1917, were manufactured during the war and are now in service. The ballistics and other features are fairly satisfactory but are capable of improvement so they will be the equal of the later models which have been developed. Improvements consist in raising the trunnions about 10 inches to increase the facility of loading, the introduction of roller bearings in the trunnions, providing improved elevating and traversing mechanisms, equipping the mounts with receivers for use with the antiaircraft director, and installing continuous fuze setters. Ten sets of parts for modifying the carriers have been manufactured in the past year. It is contemplated modifying at least 10 mounts each year until all these older types are modified.

The test of the 155-mm. gun—8-inch howitzer matériel, T2 at the Aberdeen Proving Ground is continuing. The tests with the 8-inch howitzer have been completed and tests with the 155-mm. gun are being undertaken. Upon completion of these tests this matériel will be tested by the Field Artillery Board. The preliminary test of this unit indicates that it will probably be satisfactory. It has been transported at speeds up to 50 miles per hour, this being made possible by the use of pneumatic tires and spring supports both in the carriage and limber.

The development of gun carriages and fire-control equipment for use against fast moving land targets made necessary the development of a high-speed mobile target. Such a target was developed by the Field Artillery Board at Fort Bragg and the design has been incorporated in the drawings.

THE mechanized force, organized at Fort Eustis, Virginia, during the fall of 1930, continued in operation at that station until disbanded by the War Department as of November 1, 1931. Certain units of this force were transferred to Fort Knox, Kentucky, to serve as a nucleus for the formation of a provisional squadron of mechanized cavalry.

The initial equipment of the mechanized cavalry units included a number of armored cars, which had been in use by the mechanized force, and four combat cars, T1, of the wheel and track or convertible type. The armored cars furnished were of four types, ranging from very light 4-wheel, 2-wheel-drive cars and light 4-wheel, 4-wheel-drive cars produced by the Quartermaster Corps in coöperation with the Ordnance Department, to 4-wheel, 2-wheel-drive medium cars and 6-wheel, 4-wheel-drive medium cars developed by the Ordnance Department. The combat cars, T1, were procured from the U. S. Wheel Track Layer Corporation, and are of the same design as the medium tanks, T3, (Christie), under test by the Infantry.

From the experiments carried on by the mechanized force, and now being continued by the mechanized cavalry, valuable information has been collected relative to the tactical employment of armored cars and combat cars, and data covering the desirable characteristics of such vehicles have been made available for use in the design of improved types. During the year the military characteristics of combat cars were determined and approved by the Secretary of War, and the preliminary design of a new pilot, T4, undertaken.

The several types of tanks which had been employed with the mechanized force were later turned over to the Infantry at Fort Benning, Georgia, for service and tactical tests. In order that the latest improved types of tanks might be tested in comparison with one another, and with the tanks of wartime manufacture, platoons of experimental tanks were formed from Company "F" of the 2nd Tank Regiment.

The medium tank, T1E1, (23-ton), has been completely overhauled and re-engined by the Ordnance Maintenance Company at Fort George G. Meade, Maryland. A Liberty 12-cylinder engine was installed in lieu of the original engine which did not develop the necessary power. Minor modifications also were made to the cooling system to provide the additional cooling capacity required by the use of a larger engine. This vehicle is now under test in a platoon of experimental tanks at Fort Benning.

Seven vehicles of the convertible wheel-and-track type were procured under a contract from the U. S. Wheel Track Layer Corporation. Three of these vehicles, known as convertible medium tanks, T3, are undergoing test by the Infantry, and four, known as combat cars, T1, by the Cavalry. This tank weighs approximately 11 tons and is powered with a 12-cylinder Liberty engine. It carries a crew of two men, one driver and one gunner.

A 12-cylinder Liberty engine has recently been modified to permit the air-cooling of the engine for tank installation. After the modified engine has been submitted to a thorough block test at the proving ground, it will be shipped to Fort Benning for installation in a Mark VIII tank at that station.

During the past year the Ordnance Department has coöperated with the Signal Corps in an effort to equip combat vehicles with satisfactory means of signal communication. When new designs are being initiated careful consideration is given to the size and power requirements of the latest improved types of radio receiving and transmitting sets for the purpose.

Experimental work and tests have been carried on throughout the year in an effort to develop suitable wheeled prime movers for light, medium and heavy artillery. Some of these tests were conducted at the proving ground, but the majority of the comparative tests were carried on by the Field Artillery at Fort Bragg. A wide variety of trucks were tested under this program, ranging in size from 1¼-ton to 10-ton, and in type from the 4-wheel, 2-wheel-drive, to the 6-wheel, 6-wheel-drive. A test of the 1½-ton Ford trucks as prime movers for a battery of 75-mm. guns just recently has been initiated. A number of different models of commercial tractors are being tested at the proving ground, with a view to possible standardization in case it is found they satisfactorily meet military requirements. These include agricultural tractors both of the wheel and full track types.

SATISFACTORY progress has been made in the centrifugal casting process for manufacturing cannon during the past year. Much has been accomplished in improving the melting, pouring, casting and heat-treating of centrifugal castings.

The effect of inclusions in steel has been studied extensively. In all such work, primary attention is given to gun forgings, centrifugal castings and, to a lesser extent, alloy steels used in general ordnance construction. This is a continuing research project and is being investigated along the following lines: Vacuum fusion analysis for oxygen, hydrogen, and nitrogen; electrolytic extraction of inclusions and chemical analysis of residue; chemical analysis; study of fractures and properties of test specimens; study of macro-etching, and micro-examination.

Research leading to the further development of the welding method of gun carriage construction has been continued. Special attention has been paid during the past year to the following phases: Building of tool tips by adding molten metal, this has not proven economical; flash welding; T-welds from the design standpoint; welding of aluminum and its alloys; welding of armor plate such as is used on tanks and armored cars; welding electrodes both coated and uncoated, and X-ray technique in examining welds and interpreting results.

Corrosion of expensive items of ordnance in storage or in service is a serious problem. The investigation covers two phases: The study of metals to resist corrosion, and the study of corrosion to ascertain its cause and how best to prevent it.

Optical research toward the standardization of optical elements discussed in my last year's report, has been continued and satisfactory progress has been made in the standardization of optical elements and optical systems. It has been established during the past year that optical glass suitable for fire-control instruments can be manufactured by an American manufacturer, and specifications have been prepared for use by the Ordnance Department which are satisfactory to both the department and to the optical glass manufacturer.

We have been working on substitutes for other strategic and critical materials. The high-speed tool steel composition, reported last year as having been developed and which contains none of the strategic material tungsten, has been manufactured commercially, and for the past year has been under test on regular production work in the various manufacturing arsenals. No trouble has been experienced with this composition, and it is considered a satisfactory substitute for the standard tungsten high-speed tool steel. Studies have been continued which, it is hoped, will lead to the possible re-

placement of manganese in ordnance steel, or at least to the utilization of the low grade manganese ores, of which there exists a large quantity in the United States. Considerable experimental work has been accomplished which, it is hoped, will lead to the replacement of the strategic material—tin—in solders. Two types of bronzes have been investigated for use in instrument manufacture and general construction work, neither of which contains tin.

TIN is required in the tin and terne plate sheets used in packing cans, packing box linings, ends of fibre containers, etc. It is considered that, in an emergency, these components could be made of galvanized sheets or plain steel or iron sheets coated with paint, and thus reduce the tin requirements. A tabulation has been prepared and recorded which lists all components requiring tin or terne plate, together with a suitable substitute containing no tin.

The requirements for the strategic material shellac have been materially reduced by the adoption, after thorough investigation, of acid-proof black paint as the interior coating for shell and bombs. The main demands of the Ordnance Department for shellac are in pyrotechnics. Hence study is being directed with the view of reducing shellac needs for this purpose.

During the fiscal year 1932 tests were conducted at Aberdeen Proving Ground with flares utilizing parachutes made from voile, batiste, sunsilk, and light weight rayon. These tests indicated that all parachutes, except those made from voile, were satisfactory as substitutes for imported silk. In view of the fact that rayon appears to be most promising, due to its availability in large quantities, emphasis is being placed at present on this material. It is being subjected now to exaggerated storage conditions, after which additional tests of flares equipped with rayon parachutes will be conducted at the proving ground.

A considerable number of the 500 charges for the 155-mm. howitzer, and the 100 charges for the 155-mm. gun, assembled with cotton cartridge bags, which were sent to Fort Bragg for service test in regular target practice, have been fired with satisfactory results It is expected that these tests will result in the approval of the cotton cloth as a satisfactory substitute for silk cartridge cloth for all weapons except major caliber guns and minor caliber howitzers.

SUFFICIENT experience has now been had with the centrifugal casting process for manufacturing cannon to indicate that in addition to the much more rapid rate of production, cannon tubes can be delivered to the finishing and rifling shop at approximately one-third less cost than for cold-worked forged tubes. The cold-working method of gun construction is now standard, and is applied to all small and medium caliber cannon regardless of whether or not the unit is made from a centrifugal casting or a forging. The process has continued to be most successful.

The welding process of gun carriage construction is now standard and all carriages built during the past year have been by this process. The welding process results in quicker delivery, more uniform quality, less weight and reduced cost, than if steel castings were used.

The Gage Division, in collaboration with representatives of other Government departments and the leading gage manufacturers, has done considerable research work on the development of combination ring and snap gage blanks for use with small component parts, and the standardization of commercial adjustable snap gages covering the complete range of sizes. These standards will, in time of an emergency, eliminate controversy and insure the supply of gages of these types within a much shorter period of time. Reference tables have been compiled for pipe threads, as well as the American national form threads, which eliminate the personal element, and insure uniformity and simplification of design in time of an emergency. New standard forms have been prepared to agree with American Gage Design Standards; these forms make it only necessary to fill in dimensional sizes, thus eliminating a great deal of duplication of effort and resulting in a saving of time, as well as providing a uniform drawing for each type of gage.

Three hundred and sixty-six trucks, shop, light machine M1, M1918, were dismantled and the chasis turned over to the Quartermaster Corps for conversion into cargo trucks for issue to the Army. Thirty-three trucks, shop, light machine, M1, M1918, were likewise converted into cargo trucks and issued to the National Guard. Three hundred and ninety-one Ordnance trailers were declared obsolete and disposed of.

AT the close of the World War, there were on hand 135,000 obsolete U. S. rifles, caliber .30, M1898, Krag. These have been disposed of by loan and by sale to individuals, organizations of war veterans, other patriotic organizations and schools, under existing laws and regulations. The supply of these weapons has become exhausted, with the exception of approximately 2,000 which can be used for drill purposes but not for firing of blank ammunition.

A considerable quantity of captured German trophy matériel was also disposed of during the past fiscal year to patriotic organizations and municipalities, for decorative, memorial and museum purposes. The major items involved, included 130—105-mm. German howitzers and carriages and approximately 500 obsolete small arms including machine guns.

In order to reduce the cost of manufacturing and preparing saluting charges for posts, camps and stations, the 3-inch wrought iron saluting gun was replaced by the 3-inch field gun at all posts, camps and stations, with the exception of those in the Second and Third Corps Areas. This substitution of weapons makes it unnecessary to manufacture additional cartridge cases for the old saluting guns which would have cost approximately $100,000.00.

The modernization of methods of property accounting at all Ordnance establishments under control of the Chief of Ordnance, by the installation of bookkeeping machines, has been completed. The installation of these machines is contemplated for the depots of the insular possessions, including the sub-depot located at Schofield Barracks, T. H. These installations, however, will not change the existing relationship between the depots and the Chief of Ordnance, insofar as control of stores is concerned. They were made primarily for the purpose of eliminating lengthy replenishment requisitions by the substitution of a progressive system of supply which, it is hoped, will minimize the time required in actually delivering supplies to these points.

The use of the machine system of property accounting, as developed by the Ordnance Department, has effected a material saving in time required to supply field organizations and has greatly increased the efficiency and effectiveness of the Ordnance Provision System in general.

ALL members of the Army Ordnance Association and their friends are invited to attend the Fourteenth Annual Meeting and dinner of the Association which will be held at the Union League Club, Park Avenue at 37th Street, New York City, on Wednesday, December 21, 1932. Dinner will be served in the Hall of the Club at 6:30 P. M.

THE dinner will be in compliment to the Honorable Newton D. Baker, Secretary of War 1916-1921, who will be the principal speaker, and to the Association Medalists for 1932: Honorable Frank A. Scott, Brigadier General John H. Rice and Brigadier General Colden L'H. Ruggles, to whom the Ordnance Medal of Merit will be presented.

THE New York Ordnance District, in whose area the meeting will be held, has been invited to participate. Its assigned officers, Advisory Board and manufacturers concerned with industrial preparedness in this area will assist at the meeting.

THE Ordnance Officers assigned to the Second Corps Area, which includes New York, have also been invited to participate. The Ordnance Officials and assigned Ordnance Officers of this Corps Area concerned with the supply and maintenance of Ordnance in the field, will also assist.

THE New York Post, Army Ordnance Association, concerned with the advancement of Ordnance knowledge and the support of Ordnance organizations in the New York area, will be in charge of the arrangements for the meeting.

REQUESTS for reservations for the dinner-meeting with remittance at $3.50 the plate should be sent prior to December 18th to Lieutenant Colonel Charles G. Mettler, Secretary, New York Post, Army Ordnance Association, Army Building, 39 Whitehall Street, New York, N. Y.

Our New Pack Artillery

Successor to the Historic Mountain Howitzer

By E. C. Goebert*

THE history of mountain artillery reaches nearly as far back as the origin of mobile artillery. Almost since the inception of the gun and its carriage as an instrument of warfare, armies of the world have been faced with the problem of its use in mountainous country.

The artillery pieces used for the solution of the usual field problems, if effective weapons, are of such weight that they are prohibitive in mountain warfare even if they can be disassembled in the field, since the weight of the individual elements is too great for transportation on pack animals, the mode of travel universally agreed as necessary in mountain passes. At Perpignan in the 15th century small caliber guns and carriages divisible into parts for transportation in pack were made. This, as nearly as can be found, is the first record of the creation of mountain artillery. Much of the early history and development of mountain artillery is contained in an article *L'Artillerie De Montagne Dans Les Armees Europeennes* by Ch. Beckerhinn, published in 1884, and it is from this source that most of the early historical data in this article has been obtained.

The progress of the development of mountain artillery by the French as recorded seems to have been slow until during the period of the War of the Spanish Succession in the 18th century when some special guns and carriages were constructed for use in the Pyrenees. These guns were one pounders weighing about 110-lbs. and about 5 feet, 6 inches in length. The carriage being constructed of wood was light since the entire unit and twelve rounds of ammunition were transported on one mule. From the one pounder gun the next step was toward a howitzer of large bore and shorter tube which appeared as a four pounder weighing 165-lbs. and about 3 feet, 3 inches long. In 1757 an amusette (a swivelled and stocked gun firing solid, ball shot) was constructed for mountain use which fired a 2.2-lb. projectile. The gun weighed 220-lbs. and was 21 calibers in length. The Portuguese successfully used this weapon during the war with Spain in 1760.

It was not until 1790-1800 that special detachments of artillery for mountain warfare were formed in the French Army. These units were used in the war in upper Italy and were equipped with three pounders. The guns were light in weight and were mounted on bracket trail carriages which were later replaced by one-piece carriages with trough-shaped trails which, when in firing position, were loaded with rocks and earth to reduce the recoil of the gun and carriage.

The carriage was found to be entirely too light and was replaced by a heavier unit which for transportation was subdivided into the gun, the wheels and the carriage, three loads in all. In this weapon the gun weighed 165-lbs. and the carriage 176-lbs.

A new unit made its appearance in 1803. It was a three pounder weighing 176-lbs. mounted on a 110-lb. carriage, and while the guns gave fairly good results they were small and the fire power was considered inadequate. These results lead to the development successively of four, eight and twelve pounder guns and 6- and 8-inch mortars, all of which in turn and after lengthy experiments, were abandoned due to the great number of pack animals required for their proper transportation.

By the year 1884 the French had standardized on three sizes of mountain weapons, a three pounder gun, a six pounder gun and a 5½-inch mortar.

The Austrians seemed to have been later than the French with the development of this class of artillery. The first of their guns were known as "falconets" and were used in the Corsican expeditions in 1730. The small field pieces used by the frontier regiments of Croatia and Slavonia were used as mountain artillery during the Seven Years War (1756-1763) since the falconets of three and six pounders were considered as inadequate artillery for the purpose.

Austria did not consider mountain artillery as a separate type in 1753 since at that time history shows their artillery divided into three classes: field, siege and fortress. In the latter part of the 18th century, about 1794, the Austrians, like the French, created separate units of mountain artillery which were equipped with light bronze guns of one and three pounders mounted on light bracket trail carriages made of wood. The axles and wheels were removable from the carriage for pack transportation.

THE development of English mountain artillery parallels that of the other European nations except in one interesting point. The rocket as a new weapon of warfare was introduced to the nations of Europe by the English as a result of experience with the Orientals in India in 1780. It had been known to the Oriental nations for a long time previous to this date but its effectiveness was not known to Europe. The English believed that in the rocket they had the much-sought-for solution of mountain artillery. Attempts were made to perfect its use for this purpose and as a result nothing was done for a considerable period of time toward the further development of the gun or howitzer for mountain use. As late as 1804 the English were developing rockets. These at first were for incendiary purposes only and some of them were successfully used in 1806 at Boulogne and again in 1808 at the siege of Copenhagen.

The rocket has an interesting history which, while not directly bearing upon the subject of this article, nevertheless is of sufficient importance to mention. It was the rocket which lead directly to the development of shrapnel. Although the rocket was at first for incendiary purposes only, shortly after its introduction to Europe a Danish artillery officer conceived the idea of placing a hollow projectile at the front end so that a missile instead of fire could be thrown. In 1814 an Englishman, Congreve, filled the hollow projectile with slugs and thus created the shrapnel used by the English at the Battle of Waterloo.

The delay caused by the rocket experiments found the Eng-

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lish as late as 1850 with no solution of a caliber of artillery suitable for mountain use. As is inferred in the following quotation taken from the fourth part of "Aide Memoire—the Military Sciences," published by a committee of the Corps of Royal Engineers: "Various opinions have been entertained on the subject of mountain artillery and the service it is capable of rendering to an army. By some the lighter guns usually employed, and especially those carried on mules, have been considered to be utterly worthless, by others their value has been overrated. It cannot for a moment be supposed that any such artillery in any possible number can be compared in effect with good field batteries capable of overcoming all the ordinary difficulties of ground, but in the mountains, excepting in the immediate vicinity of the great roads which traverse them, the best equipped field artillery is liable to become paralyzed by obstacles that it cannot master, and to be rendered not only useless but a cause of serious embarrassment to the troops to whom it is attached."

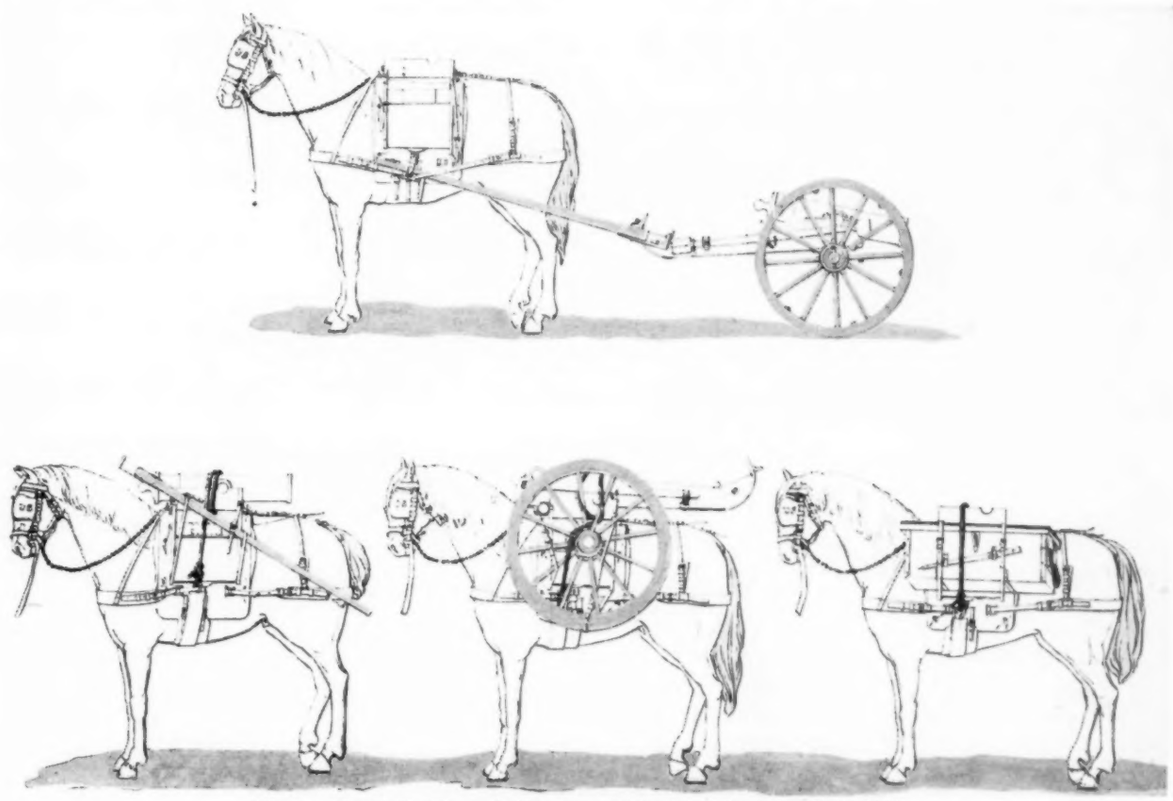

Fig. 1. The 12-lb. Mountain Howitzer of the U. S. Army in Pack, 1841.

There is given in Table I a tabulation with respect to mountain artillery in the European countries in 1870:

TABLE I

NAME OF COUNTRY	Size in lbs.	Caliber in mm.	Wt. of Gun and Breech in lbs.	Velocity f. s.	Range Yds.	Type Carriage	Wt. Without Gun, lbs.
Austria	3	74.12	181	770	2453	Bracket trail	207
France	4	86.50	220	737	2620	One Piece	257
Italy	5⅛	86.50	220	880	2180	One Piece	251
Switzerland	4	84.45	227	783	2180	One Piece	251
Russia	4	86.86	222	762	2507	One Piece	343

In 1829 the French had discovered that the most satisfactory weapon for mountain artillery was a 12-lb. howitzer. Had they adhered to their expressed belief and concentrated upon this one weapon much time would have been saved in the development of this type of artillery. There is a record that Austria in 1844 adopted the 12-lb. howitzer as its only mountain weapon as likewise did the British in 1860.

France, Austria and England, however, changed their views for no other reason than that they were not able to produce a satisfactory light vehicle which could be transported and it was not until about 1880 that the English introduced the first gun and carriage which could be taken apart into acceptable loads for pack transportation.

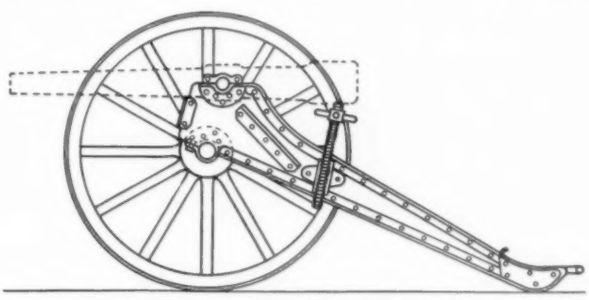

Fig. 2. The Hotchkiss 12-lb. Mountain Gun.

THE early history of American mountain artillery is rather vague. Tousard, in his "Artillerists Companion" published in 1809, describes mountain artillery of European pattern but is silent as to anything distinctly American. In 1860 John Gibbon, 1st Lt., 4th Artillery, U. S. Army, described mountain

artillery of the American Army as a 12-lb. howitzer on a carriage formed like the field gun carriage but much smaller (Fig. 1). The checks or trunnion arms were formed as part of the trail. The axle tree was of wood which, as he stated, lessened the recoil and gave an elasticity to the whole carriage, better to resist the shock of firing. The wheels of the carriage described by Gibbon were 38 inches in diameter. The carriage for transportation over rough ground was packed on two mules, number one carried the howitzer and shafts, 251-lbs., and number two the carriage, 295-lbs. Where it was possible to travel on the wheels, shafts were provided for attachment to the trail and one mule was used in draft.

Fig. 3. The 2.95-inch Vickers-Maxim Mountain Howitzer.

Capt. Lawrence L. Bruff, of the Ordnance Department, in his "Ordnance and Gunnery" published in 1896, described the Hotchkiss mountain carriage for the 3.6-inch field mortar as the American mountain artillery (Fig. 2). The flasks of this carriage were made of steel strengthened with angle iron and with transoms and trail plate. The axle was solid and the wheels had bronze hubs. Ropes were used to check recoil by tying them around the spokes of the wheels and passing them over the trail. The Hotchkiss carriage was a two-mule pack load, the mortar weighing 244-lbs. and the carriage 220-lbs. Shafts were provided for attachment to the trail for draft transportation on its wheels.

Lissak in 1907 described the Vickers-Maxim mountain gun as the mountain artillery used by the United States Army. The weapon, secured from the English about 1898, was a 2.95-inch howitzer. It was of American and British manufacture and separated into four pack loads; the gun and breech, the cradle including recoil mechanism, the trail, and the wheels and axle. The cradle load was the heaviest and weighed 243-lbs. The general characteristics of the unit (shown in Fig. 3), are as follows: muzzle velocity, 920 ft./sec.; weight of ammunition, 12.5-lbs./rd.; maximum range, 4825 yds.; length of recoil, 14-inches; maximum elevation, 17°; depression, -10°; traverse, 0°; total weight of gun and carriage, 909-lbs.

The gun is cylindrical in form forged with two lugs, one on each side at the breech end. To these lugs are attached the piston rods of the recoil mechanism. There are two finished collars on the gun tubes; one close to the muzzle, the other midway of the tube, which act as bearing surfaces when the gun recoils in the cradle. On the bottom of the tube is a lug which slides in a groove in the cradle and thus acts to take the torque due to the rifling twist when the piece is fired.

The breech has an interrupted screw thread and is operated by the handle on the left side which rotates the block open and swings it clear for loading. A recoil mechanism of the hydro-spring type is used consisting of two cylinders, one on each side of the cradle and cross connected by a by-pass at the rear end. The force of recoil is absorbed by throttling oil from one side of the piston to the other and compressing the counter-recoil springs which act to return the gun to battery at the end of recoil. A buffer is provided to take the shock of counter recoil.

The cradle, which is a bronze casting, consists of three cylinders with parallel axes, the center cylinder for the gun and those on the right and left for the recoil mechanism. The trail is built-up of two side plates braced with cross transoms. At the rear is the spade and hand-spike hole while at the front are the bearings which take the tubular axle.

The elevating mechanism consists of a simple worm-wheel quadrant into which the worm operates from the elevating hand wheel through a gear train mesh. Traverse is obtained by shifting the trail by means of a hand spike. The spade area provided is not sufficient and, to prevent excessive rearward motion of the carriage in firing, brake ropes which fasten to the trail and loop around the wheel felloes are provided. These ropes are clearly shown in Fig. 3.

IN 1908 the Ordnance Department produced a pilot mountain howitzer and carriage which was designated as the 3-inch mountain howitzer and carriage, model 1908. Tests were made with this model and as a result it was redesigned and a second pilot, the model of 1911, was constructed. The general characteristics of this model are muzzle velocity, 900 ft./sec.; range, maximum, 5570-yds.; weight of projectile, 15-lbs.; maximum elevation, 40°; depression, -5°; traverse, 6°; length of recoil, 37-ins. at 0° elevation, 14-ins. at 40°; weight of gun and carriage, 1124-lbs.

The unit was carried in five pack loads; (1) the howitzer and breech, (2) the cradle and recoil mechanism, (3) the

Fig. 4. The 3-inch Mountain Howitzer Carriage, Model 1911, in Pack.

trails, (4) the axle and top carriage, and (5) the wheels and shield. The maximum pack load was the trails which weighed 239-lbs. (Fig. 4).

The howitzer separated from a sleigh by a latch at the rear end which, when opened, allowed the tube to be raised and unhooked at the front. The slides were on the sleigh which was carried assembled to the cradle as a part of its pack load. The carriage was equipped with a demountable shield composed of four sections which were carried in pack on the wheel animal.

An interesting point of difference between the model of 1908 and that of 1911 was the construction of the trails. In the 1908 model the trail was built-up of tubular sections. The total length of the trail was 94-inches and was jointed to fold to a 47-inch pack-load length. The 1911 trails were made of flat plate riveted into a box section. The length was also 94-inches folding to a 47-inch pack load.

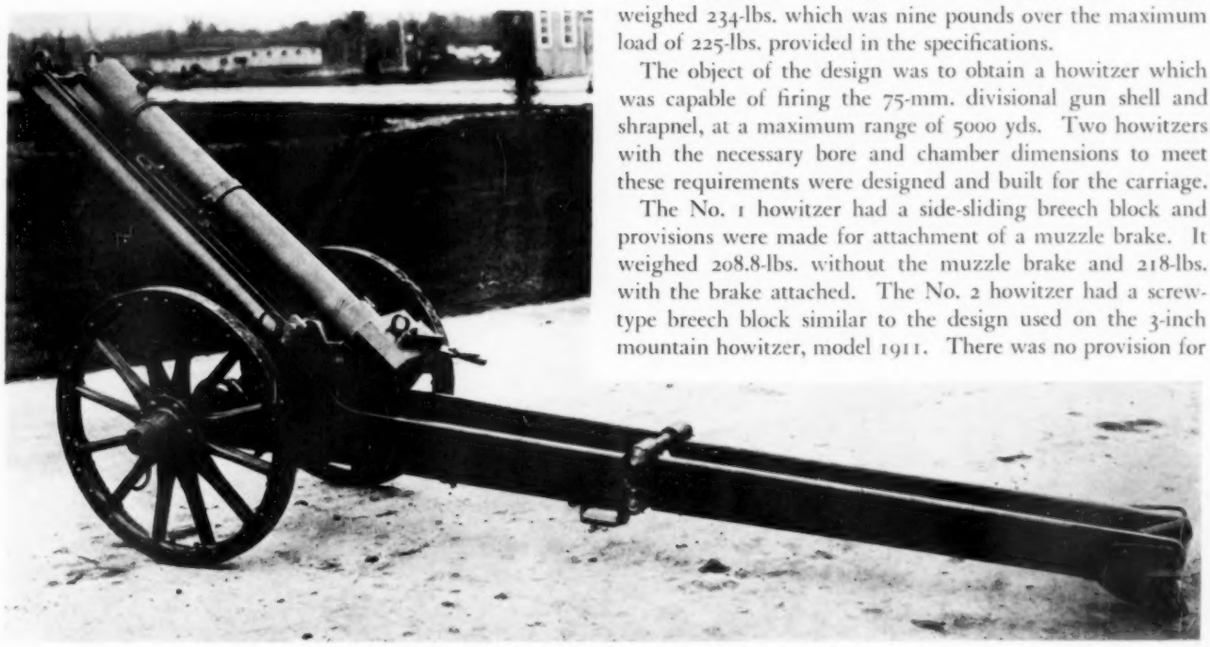

Fig. 5. The 75-mm. Pack Howitzer, Model 1920, Long Trail.

From 1911 on through 1913 and 1914 the pack equipment for the 3-inch mountain howitzer, model 1911, was under development. Then followed the World War in Europe with a subsequent entry of the United States into the conflict on April 6, 1917.

During the World War there was no pressing demand for mountain artillery so that progress was delayed in the development of this type of artillery nor was it considered sufficiently important during the year of adjustment following the Armistice on November 11, 1918.

In the Fall of 1919, to be exact on September 12th, the subject of pack artillery was again revived and a special subcommittee was appointed by the Chief of Ordnance to consider specifications for the design and manufacture of this type of artillery. The committee made its recommendations on October 28, 1919 and, based upon them, designs were completed and manufacture of the pack howitzer, model 1920, was directed (Fig. 5).

Two units of this model were built and designated as No. 1 and No. 2. They were completed early in 1921, and after preliminary proof-firing at Rock Island Arsenal were shipped to the Aberdeen Proving Ground where they arrived in March of 1921.

The general characteristics of these units were as follows: caliber, 75-mm.; muzzle velocity, 900 ft./sec.; weight of projectile, 15-lbs.; maximum range, 6600 yds.; length of recoil, 0° elevation, 28-inches, 45° elevation, 18-inches; maximum elevation, 45°; depression, -5°; traverse, 5°; weight of howitzer and carriage, 802-lbs. The units were designed for four-load pack consisting of (1) the howitzer and breech, (2) cradle and recoil mechanism, (3) trail, (4) wheels and axle. The cradle and recoil mechanism were the maximum load and weighed 234-lbs. which was nine pounds over the maximum load of 225-lbs. provided in the specifications.

The object of the design was to obtain a howitzer which was capable of firing the 75-mm. divisional gun shell and shrapnel, at a maximum range of 5000 yds. Two howitzers with the necessary bore and chamber dimensions to meet these requirements were designed and built for the carriage.

The No. 1 howitzer had a side-sliding breech block and provisions were made for attachment of a muzzle brake. It weighed 208.8-lbs. without the muzzle brake and 218-lbs. with the brake attached. The No. 2 howitzer had a screw-type breech block similar to the design used on the 3-inch mountain howitzer, model 1911. There was no provision for muzzle brake and the howitzer complete with breech mechanism weighed 185-lbs.

The two carriages were identical in general principles except in the following respects: The No. 1 carriage had the opening for attachment of the axle at the forward end of the trail cut at 25° with the horizontal to permit assembly of the axle while the trail was resting on the ground and before the wheels were attached. The No. 2 carriage had the axle fastening open directly under the trail on a vertical line which required assembly of the wheels to the axle and then placing the trail down over the axle.

The trunnions of both carriages were located to the rear of the center of gravity of the tipping parts which resulted in an unbalanced load in elevating about the trunnions. This had to be compensated for by the introduction of equilibrators into the design. Artillery design practice in the United States had up to this time very little experience in equilibration and as a result the springs which were designed for the No. 1 carriage proved unsuccessful and were replaced by a drum on the elevating pinion shaft. To this was fastened a small wire rope which exerted a turning effort on the elevating pinion shaft by a pull applied by a helical spring contained in a flanged steel case riveted to the side of the trails.

There were two lengths of trails provided for the test with the carriages. The recoil mechanism was a St. Chamond type hydropneumatic with variable recoil control which gave 28-

inches long recoil and 18-inches short recoil. The proving ground test of these carriages brought out many defects, some of which are here extracted from the report:

The spades were not of proper shape and consequently would not seat in firing without first digging them in. The trunnion latches were not positive and disengaged in firing. The extractor failed to eject the cartridge case. The breech operating handle on the No. 1 howitzer interfered with the range quadrant so that the block could not be opened or closed with the quadrant in place. The trail hand-spike socket interfered in pack. An interference existed between the pack fastening ring on the end of the recoil mechanism and the trail transom at about 31° elevation. The method of wheel fastening was not positive.

These defects could have readily been corrected and were not considered serious, and in June, 1921, it was recommended that the No 1. carriage be sent to the pack artillery at Camp Stanley, Texas, to be tested in pack on a 500-mile march. On August 15, 1921, it was decided that studies of a new design be undertaken to correct the faults of the 1920 model and to embody such new features as were found desirable as a result of the experience gained with the carriages tested.

To complete the history of the model 1920, 75-mm. pack howitzer carriage, on June 26, 1923, the Field Artillery definitely recommended that this model be not considered for adoption as a standard for the using service.

THE new specifications as proposed for the next design were as follows: caliber, 75-mm.; muzzle velocity, 900 ft./sec.; weight of projectile, 15-lbs.; maximum range, 6600 yds.; maximum length of recoil, 28-inches; trail to be in two sections, forward not to exceed 48-inches, total length not to exceed 70-inches; stable with maximum charge at 15° elevation; breech to clear the ground in recoil at all elevations below 38°; wheel base (width of tread) 29-inches; elevation, 45° if possible; traverse, 5°; number of loads, 4; maximum weight of load, 225-lbs.

The design resulting from these specifications was designated the 75-mm. pack howitzer, model 1922, type A (Fig 6). A wooden model was constructed but it never went beyond this stage for reasons which will follow. On May 4, 1922, a memorandum was received by the Ordnance Department from the Office of the Chief of Field Artillery which requested that the development of the model 1922, type A, be held in abeyance pending further study of the entire problem of pack artillery.

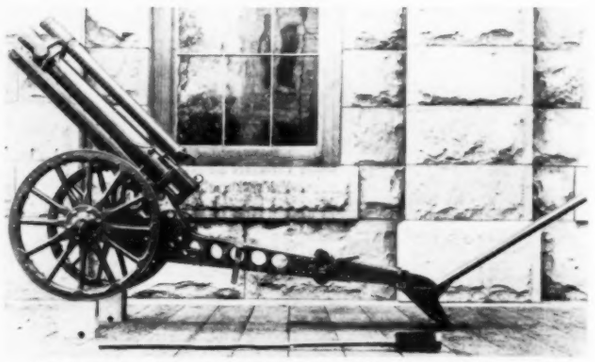

Fig. 6. The 75-mm. Pack Howitzer, Model 1922 E, Type A.

The solution of the pack howitzer problem up to this time had been undertaken on the basis of the use of four animals for pack with a maximum limitation of 225-lbs. load per animal. This had naturally placed a definite limitation on the maximum permissible weight of the unit and directly limited the weapon to a comparatively low muzzle velocity for the weight of projectile specified.

Based upon studies of the progress and line of thought of several European nations which had returned to the solution of the problem of mountain artillery after the World War, the Office of the Chief of Field Artillery expressed a view which can best be explained by quoting in part from an official memorandum on the subject:

"The tendency abroad, noted from study of what reports are available, is toward the development of a light field gun or howitzer of medium power which is normally transported in draft by one or more animals in tandem, but which may, when the occasion requires, be broken into six or eight loads of greater weight than those for which we strive, but which are nevertheless packable.

"Our own conception of this weapon as exemplified in our latest design, is a howitzer of light weight and low power, broken into four loads which can, without undue fatigue to the animals, be habitually packed.

"The point of particular interest in this tendency abroad is the design of pack material of considerably greater power than we have considered. This increase in power is utilized in

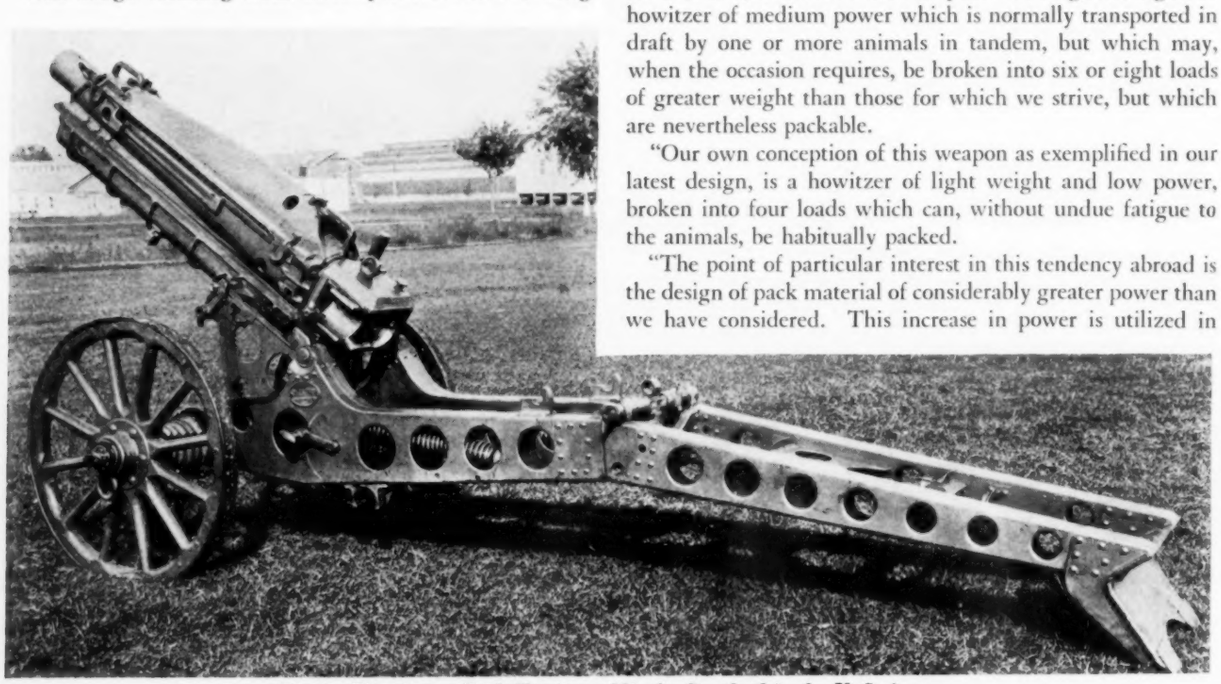

Fig. 7. The 75-mm. Pack Howitzer, M1, the Standard in the U. S. Army.

either an increase in range, as for example in the Krupp, Japanese and Schneider designs, or in an increase in the weight of the projectile as in the case of the Schneider 105-mm. howitzer, the British pack howitzer and the Italian pack howitzer, as compared with our own design."

Thus was the path opened for reconsideration of the entire problem of design of a suitable piece of artillery for mountain use. A new line of thought was injected into the problem which from this time on progressively developed into one of the most efficient pieces of artillery designed for use in the United States Army.

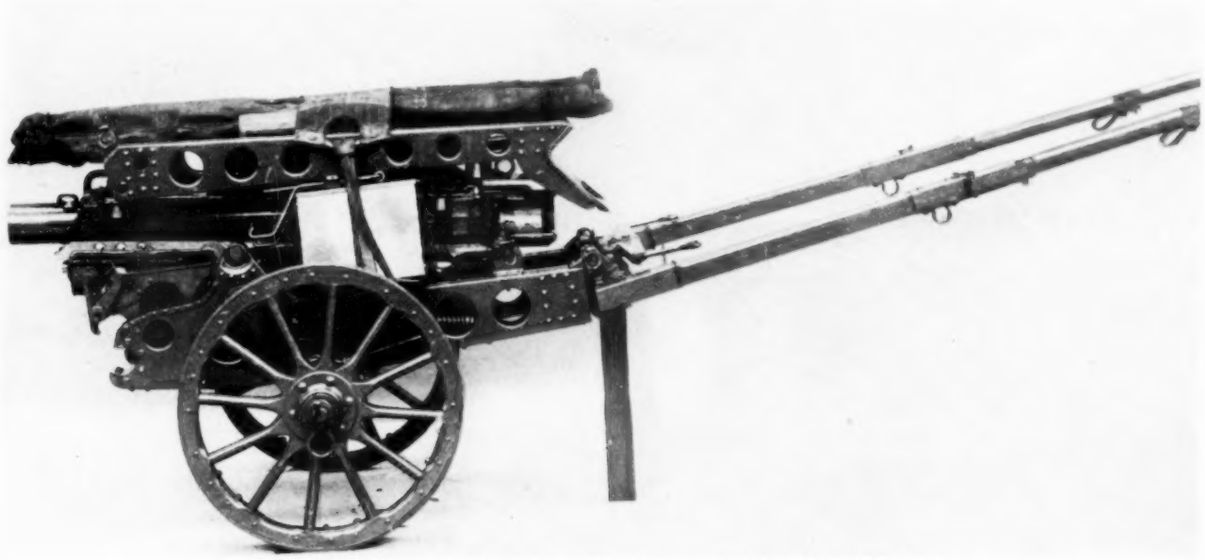

Fig. 8. The 75-mm. Pack Howitzer, M1, Arranged for Draft Transportation.

CONTRARY to usual practice, calculations and study drawings were made and based upon and around these, tentative specifications, in part as follows, were written in June of 1922 for the 75-mm. pack howitzer, model 1922, type B: caliber, 75-mm.; weight of projectile, 15-lbs.; muzzle velocity, 1250 ft./sec.; maximum range, 9000-yds.; weight of howitzer, 220-lbs.; weight of breech, 120-lbs.; carriage, box trail axle traverse; elevation range, -5° to + 45°; recoil constant 32-inches, no recoil pit to be required; traverse, 5°; stable with normal charge at + 10° elevation; total weight in traveling position, 1310-lbs.; ground clearance under carriage, 13.5-inches; length of trail center line of axle to spade, 96-inches; pack loads, 6 distributed as follows: (1) tube (howitzer) 220-lbs., (2) cradle and breech 210-lbs., (3) sleigh (recoil mechanism) 220-lbs., (4) front trail, 220-lbs., (5) rear trail and counter weight 220-lbs., (6) wheels and axle 220-lbs.

A wooden model of this carriage was built and carefully studied by all concerned and as a result recommendations were made which required a restudy of the design principally for the purpose of relocating the centers of gravity of the various loads to make them more adaptable for pack loading.

The corrected design was designated as the model 1923E, type B, and was authorized for manufacture on February 5, 1923. The unit was finally completed at Rock Island Arsenal in February, 1924. It is interesting to note that when completed the unit weighed in traveling position for draft 1375-lbs. and that the pack loads, as finally arranged, weighed as follows: (1) tube-howitzer, 224-lbs., (2) cradle and top sleigh, 215-lbs., (3) bottom sleigh and recoil mechanism, 215 lbs., (4) front trail, 215 lbs., (5) rear trail and axle 180 lbs. Shafts and single tree for draft and accessories brought the total weight to the 1375 lbs. total weight in draft.

After preliminary proof firing and a short road test at Rock Island the unit was sent to Aberdeen Proving Ground where it arrived late in April, 1924. The tests of the weapon were initiated in May and shortly after they began the top and bottom sleigh failed. The desirability of a fixed spade was also recognized and as a result the carriage was returned to Rock Island in August for redesign of the elements that failed and the spade.

The carriage had proved so successful, however, that a second unit was ordered which embodied some few minor changes which in no way effected the principles of the design.

The proving ground tests of the modified No. 1 and the No. 2 units showed them to be acceptable and in August, 1925, the No. 1 carriage and its howitzer were sent to the Pack Artillery Board at Fort McIntosh, Texas, where it was tested in pack on the aparejo and later on the new Phillips pack saddle which became available in the latter part of 1925.

In July, 1925, two more of these units, the No. 3 and No. 4, were ordered manufactured. These units were built with slight improvements over the two which had preceded them but were identical in principle of design since it was now recognized that at last an efficient mountain weapon had been found. These units were designated as the 75-mm. pack howitzers, M. 1923 E 2.

The two units M. 1923 E2 were shipped to Aberdeen Proving Ground in the latter part of 1926 and from there to Fort Robinson, Nebr., for test by the Pack Artillery Board after which they were standardized to replace the 2.95-inch Vickers-Maxim mountain gun on September 22, 1927.

In October, 1927, the Pack Artillery Board recommended the adoption of the Phillips pack saddle as the standard, and fully to determine its suitability as well as to test thoroughly the howitzer and carriage a 500-mile march was ordered.

On July 31, 1928, an outfit made up of 75-mm. pack howitzers of 1923 models, four in all, together with ammunition and accessories, packed part on aparejo and part on Phillips

saddles, left Fort Robinson. The route of the march was to Fort Meade, S. Dak., by way of Hot Springs and Buffalo Gap, S. Dak. Upon arrival at Fort Meade a 150-mile circuit was made through the Black Hills which included a climb of Harvey Peak over a rugged mountain trail. When this circuit was completed the unit returned to Fort Robinson by way of Hermosa, Custer and Hot Springs, S. Dak. The march was completed on September 4, 1928.

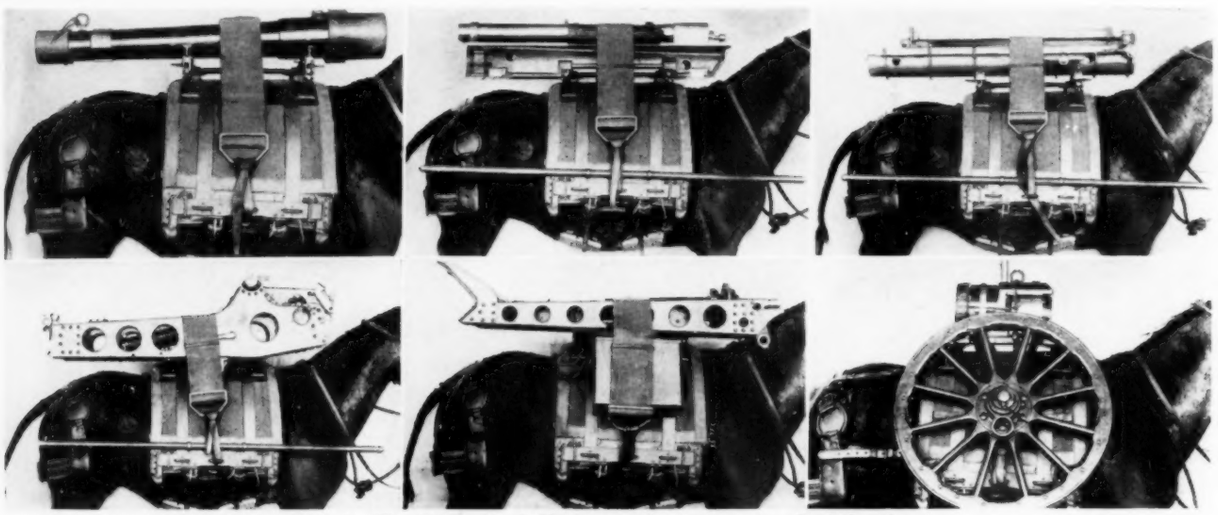

Fig. 9. The 75-mm. Pack Howitzer, M1, Arranged in Pack Loads.

Top (left to right): 1. The tube; 2. Bottom sleigh and recoil mechanism; 3. Cradle and top sleigh; (Bottom) 4. Front trail; 5. Rear trail and axle; 6. Wheels and breech.

After certain adjustments and relocation of the loads on the saddles, the Phillips saddle was finally adopted as standard on March 15, 1929.

The 75-mm. pack howitzer M 1 is illustrated in Fig. 7. The matériel is designed to be separated into units suitable for pack transportation and for draft by two mules in tandem (Fig. 8). The howitzer is so arranged that the tube is separated from the breech ring for transportation in pack.

All possible weight within reasonable limits has been placed in the recoiling parts to increase the ratio of weight of these parts to weight of projectile which results in reduced firing stresses on the carriage and the consequent reduction to a minimum of the length and weight of the trail.

When assembled the howitzer tube attached to its breech ring rests in a bottom sleigh which slides in a cradle. The cylinders of the hydropneumatic recoil mechanism are permanently fastened underneath the bottom sleigh and recoil with it. The piston rod is locked at the front end to the cradle which is a nonrecoiling part. Over the top of the howitzer tube is placed a top sleigh which locks into the bottom sleigh and is also an element of the recoiling parts.

The elevating rockers, two in number, are permanently trunnioned to the front trail section and the cradle assembles to and is locked into these rockers. The front end of the front trail section assembles and is locked to the axle traversing mechanism. The rear trail section is jointed to the front trail section by means of a lock. The general characteristics of the weapon are as follows: weight of projectile, 15-lbs.; muzzle velocity (maximum), 1250 ft./sec.; maximum range, 9200-yds.; elevation, 45°; depression, 5°; traverse, 5°; recoil, 32-inches; height of bore above the ground at 0° elevation, 27.5-inches; ground clearance in animal draft, 10.5-inches. Pack loads (Fig. 9): (1) howitzer tube with muzzle cover and 1 lifting bar, 229-lbs.; (2) bottom sleigh with recoil mechanism, 1 lifting bar, 2 oil cans and 1 oil can carrier, 224.6-lbs.; (3) cradle, top sleigh and 1 lifting bar, 228.5-lbs.; (4) front trail and 1 lifting bar, 243-lbs.; (5) rear trail, axle, sight and accessories, 248-lbs.; (6) wheels and breech block, 217.5-lbs.; making a total in all of 1390.6-lbs. Weight in firing position, 1269-lbs.; weight arranged for animal draft, 1471-lbs.

On the basis of pounds of weight of weapon per yard of range, the new 75-mm. pack howitzer ranks as one of the most efficient breech loading artillery weapons yet designed as the following table shows:

TABLE II

	Wt. in Firing Position, lbs.	Range yds.	Lbs./Yd. range
75-mm. Pack Howitzer, M1	1269	9200	.137
75-mm. Gun, Mod. 1897 (French)	2657	9200	.289
75-mm. Gun, Mark I	3280	14880	.220
75-mm. Infantry Mortar, M2	375	2000	.188
Vickers-Armstrongs 2.95-inch M. 1929	1526	9850	.155
Skoda 75-mm. 1928	1550	9700	.159
Schneider 75-mm. 1919	1507	9058	.166

The solution of the problem of mountain artillery has been a long and most difficult one. It is believed that the resultant carriage with perhaps minor changes as time goes on will hold its place among efficient modern artillery for some years to come.

Editor's Note: Other articles which have appeared in Army Ordnance on this subject include: "The 75-mm. Pack Howitzer and Carriage, Model 1920," Vol. I, No. 5, p. 289; "75-mm. Pack Howitzer vs. 2.95-inch Vickers-Maxim Mountain Gun" by O. L. Beardsley, Vol. II, No. 7, p. 38; "Recoiling Parts in Pack Howitzer Carriages," Vol. III, No. 15, p. 175; and general discussions in the following articles: "Post-War Artillery Matériel" by Col. G. F. Jenks, Vol. II, No. 7, p. 1; "Artillery Design" by Brig. Gen. C. L'H. Ruggles, Vol. IV, No. 19, p. 15; and "The Development of Army Ordnance" by Brig. Gen. William H. Tschappat, Vol. XI, No. 63, p. 191.

The Reduction of Armament

II: The United States Military Plan and Munitions Supply

By Charles G. Mettler*

IN the last issue of ARMY ORDNANCE I outlined the military plan by which the manpower of the country is intended to be assembled in case of need. Here I propose to present an outline of the supply of munitions with which that manpower is intended to be armed and equipped for its war duties.

It is a principle of nations that a soldier of any country should indicate his military status by the wearing of a uniform which by its color, design and insignia indicates the army to which he belongs. The first requirement of a government is therefore the supply of distinctive clothing to its soldiers. Then follow the munitions supply problems in order, food, shelter, transport, equipment, arms and ammunition. The production of all these items except the arms and ammunition is closely allied to the normal industrial production in each country, but on account of the enormous quantities required at unusual places, where commercial distribution facilities are totally inadequate, where the usual handling, housing, cooking, or transport equipment is often nonexistent, very elaborate plans must be made in advance to avoid confusion.

In this paper I intend to pay particular attention to those noncommercial items whose supply is most difficult, the arms and ammunition, but the extra and unusual load upon industry caused by the changes of direction of flow and by the changes in character of these other items of munitions supply, must not be overlooked. A man cannot be an efficient soldier unless he is clothed, fed, sheltered, and he cannot be exhausted physically in the long movements required to get him from his home to the place of battle. His arms and ammunition will be of little value if he be physically or mentally incapacitated for using them.

A SOLDIER is valuable in proportion to the amount he is able to increase efficiently his physical strength by the use of mechanical power or its equivalent. Unarmed masses of men are of little value in modern battle. We have interesting examples of their failures in the Russian Army in 1914, when the Russian nation found it impossible properly to arm its tremendous mobilized forces. Superiority of fire power and striking power wins battles almost without regard to the numbers engaged.

In the present machine age the augmentation of manpower by mechanically developed horsepower has been accelerated to a high degree in the preparations for war, in fact, a new word has been coined to describe the applications of machine power. The word is mechanization.

Modern warfare, being fought by all the people rather than by standing armies, must necessarily follow the advances of science and industry, for the people demand in these days that their tools for every task be the most up-to-date and most efficient tools that can be supplied. Every war agency of a government is constantly occupied in revising its tools of war to meet this demand.

The perfection of the internal combustion engine has made available such new tools of transportation as the automobile, motor truck, omnibus, caterpillar tractor, airship, airplane and submarine. It is only a short step to apply these things to the transportation of troops and supplies to and from the battlefield; to adapt them by the addition of armor and armament to use in the attack and defense of battle, and even to redesign them to produce much more powerful instruments of war than have ever been used before. We find in some armies whole units of armed and armored vehicles, such as tanks, armored cars, machine gun carriers, troop carriers and self-propelled artillery, operating at high speed over wide terrain to seek out the enemy and to disturb his communications and his preliminary preparations for battle.

With the speedier, higher capacity land transport, the supply of ammunition is greatly facilitated. This allows the use of more and more high powered ammunition-consuming weapons, such as automatic rifles, machine guns, rapid fire mortars and rapid fire artillery. The power of the individual is multiplied many times by this new mechanization of armies.

Airships and airplanes carry machine guns of higher fire power, greater accuracy and greater reliability than any World War types. In addition, many varieties of bombs have been developed for aircraft uses. Large airships have been constructed capable of carrying within their hulls a number of airplanes which may be sent out and returned in order to broaden the horizon of the airship in its search for the enemy. Tanks are taking new forms from small one-man or two-man types to new conceptions of the Horse of Troy. It is the constant aim of all armies to provide such mechanical offensive equipment that stabilized trench warfare and the achievement of victory by slow attrition will not recur. The example of the four years of stalemate in the trenches of France is a great spur to new inventions for the elimination of such conditions.

In considering this subject, we must not neglect to appraise the war value of the new discoveries and inventions being produced daily in the laboratories and factories of the world. These will be rapidly applied to war purposes in case of conflict. We may expect from such developments that a future war is likely to be a war of maneuver, fought with fewer combatants and more machines and concluded with greater dispatch than the last one.

THIS intensive mechanization of armies requires a far greater and far more complicated supply of arms and ammunition, in fact of almost all forms of war munitions than ever before. It bases the ability to wage war more and more upon the industrial capacity of a nation, and this capacity therefore becomes a definite factor in any plan for reduction of armament.

The term used to describe war-making ability is war potential, although in the Geneva discussions its meaning has often been restricted to the value of the national support outside the

*Part II of an address delivered at the Institute of Politics, Williamstown, Mass., July 29, 1932. Colonel Mettler is Executive Officer of the New York Ordnance District and was formerly Assistant Military Attaché at the American Embassy, London.

armies and navies. Yet in a broad sense it refers to every factor which may assist a nation in warfare. Some of these factors are—(a) The military and naval forces, (b) The stocks of armament, (c) The industrial capacity for making armament, (d) The resources for materials, (e) The character of the boundaries, (f) The morale of the people, and (g) The allies which are obtainable.

In our organization for the supply of munitions, we are particularly concerned with the stocks, the industrial capacity and the resources for materials.

Like all other nations we retain in the arsenals and depots of the nation a reserve of war material. This consists largely of arms and ammunition left over from the World War, either purchased abroad or produced in our factories, but as some of these items deteriorate or become obsolete, they are replaced by direction of the Congress with funds appropriated for the purpose. The government and the Congress are kept advised of the amount and the condition of these stocks each year. At times, when new weapons are produced, it is necessary to add new types to the reserves. Along with the reserve are counted the arms and ammunition in the hands of the Regular Army, the National Guard, and the training units.

The size of the war reserves is determined by the Congress and depends upon the rapidity with which the arsenals and industries of the country are able to supply the probable needs of the military and naval forces in time of war.

The maintenance and replacement of these reserves is an expensive item. We seek therefore by industrial planning to improve the time lag of supply in order to reduce the reserves and their cost. Should the time lag be increased, the Congress would be compelled for safety reasons to augment the reserves. Our country therefore openly provides for the peace-time planning of industrial mobilization as a matter of saving money and increasing the security.

Throughout the European nations arms and ammunition are supplied by large commercial organizations in times of peace. Such firms as Krupp and Ehrhardt in Germany, Skoda in Czecho-Slovakia, Schneider in France, Fabrique Nationale in Belgium, Bofors in Sweden, Vickers-Armstrongs in England, and many others produce and sell armament in the world markets and thereby retain a capacity for armament-making and maintain the art of manufacture for their nations.

In the United States there are no important firms specializing in the production and sale of armament. In order to keep the art alive and to supply peace-time needs, we maintain six government manufacturing arsenals, Watertown Arsenal, near Boston, Mass.; Springfield Armory at Springfield, Mass.; Watervliet Arsenal, near Troy, N. Y.; Picatinny Arsenal, near Dover, N. J.; Frankford Arsenal at Philadelphia, Pa.; Rock Island Arsenal, near Rock Island, Ill. At these plants, new war machines are designed and produced. They are tested at the government proving ground near Aberdeen, Maryland. When adopted as standards, they gradually replace the older weapons in the hands of troops and in the reserves.

TO prepare the industrial organizations of the nation for the production of war requirements of the old and new weapons, in time of war, the Assistant Secretary of War in charge of all procurement of munitions, has divided the continental United States into fourteen procurement districts depending upon the industrial population and the flow of commerce. In each of these districts he has set up an organization for each of the procurement branches of the Army, each having a selected district chief, usually a prominent civilian, on the government payroll at the remunerative salary of one dollar a year. With him is assigned one or more regular Army officers whose duty it is to receive from the War Department the anticipated war load for the district, to apportion this to the proper industries in the district, and to see that each industry is in some measure prepared to take up its war load promptly. Thus at the very moment of mobilization of the armies, a number of reserve officers are mobilized in the districts and form a district organization for the procurement, inspection and shipment of war materials required to arm and supply these armies.

This conversion work is necessarily a slow process in the United States because of the fact that our industries work with large production units and their manufacturing products for any item are entirely interchangeable. It is therefore necessary for each factory to provide itself with the manufacturing jigs and fixtures that will produce all the component parts of war material to accurate dimensions, and also to provide itself with the necessary gages to determine that these component parts will fit together without interference to make complete war units. For instance, such a simple thing as the 75-mm. ammunition with its fuze, booster, adapter, base cover, cartridge case, primer and cap, may require over 1,000 gages to insure that all cartridges will fit accurately in the guns, will fire when required, will develop the same resistance through the air and the same velocity from the powder. When the projectile reaches the target this must explode uniformly under the action of its fuze and must distribute its fragments or its shrapnel balls with the best effect.

It is not needful for our present purposes to explain the details of this military-industrial organization, but it is sufficient to point out that at very little expense to the national government, in fact at a very small proportion of the cost of maintaining war reserves, our country develops an orderly and rapid conversion of the required commercial plants to the production of the munitions required by its forces in times of war.

The Assistant Secretary of War with his procurement organization also constantly examines the supply of raw materials in the country, the sources from which such materials may be obtained, and is required to assure the government and the Congress that the United States will not be caught without adequate essential materials. This country has tremendous resources, in war materials, in factories, and in man power. Its war potential is extremely high. However, it does have shortages in some materials. Such materials are known as strategic materials and careful record is kept of the stocks of all such materials on hand. Sometimes it is essential to augment the stocks from time to time in case trouble is in sight. The sources of supply are carefully noted for war purposes. Sometimes it is necessary to develop satisfactory substitutes.

For many years since the invention of smokeless powder and high explosive, sodium nitrate produced in Chili has been essential to every nation for the conduct of war. When Germany was cut off from communication with Chile its supplies of sodium nitrate were quickly exhausted. Fortunately for that country, however, it had already developed a process for the fixation of atmospheric nitrogen in the form of ammonia. It built large factories for this product and supplied its shortages. Germany also had no sources for copper and was forced to melt up all the available copper in the country

to supply brass for its cartridges and copper for the rotating bands of its artillery shell.

Since the World War we note the attempts of every nation to render itself independent of the others in its sources of supply or to ally or otherwise strengthen itself with nations upon which its supply is dependent. Every large country has erected in recent years within its geographical boundaries in defendable positions, large plants for the fixation of the nitrogen of the air, ostensibly of course, for the production of agricultural phosphates. The world is thus far over supplied with fixed nitrogen products.

The excessive importation of stocks of raw materials required for war purposes, of which any country is poorly supplied, is indicative of prepartion for military action. Such matters are carefully observed by all nations.

IN modern war, the requirements of armies are so much greater than the stocks of armaments which can be maintained in times of peace, or of the stocks of some materials that may be supplied, or of the armament which may be supplied by arsenals or armament factories, that many of the commercial industries of each belligerent country are required to convert their plants for the production of war equipment at the very beginning of trouble. I regret that I have not sufficient space to discuss the various subsidies and favors and methods of preparation by which other nations prepare their industries to support their armies with essential supplies in times of war. There are many interesting and devious methods. It is enough to say that they all find ways to accomplish the results.

Our country has a direct, simple and inexpensive system, which we hope will be found adequate, if ever we find ourselves involved in another conflict of arms.

THERE arises in this connection the question of whether we are justified as a signer of the Kellogg-Briand Antiwar Pact in maintaining our industrial preparedness and military system on the scale I have indicated in this presentation and in my previous article.

I feel that we are fully warranted by our various commitments in the family of nations and by our American geographical position in providing means to demonstrate the potential power of the nation before the world. In doing so, we do not lessen in any way that splendid international accord which has been secured toward the elimination of war as a national policy. If the Kellogg-Briand Pact is to be a rule of behavior among nations, the rule must have behind it sufficient physical power to deter nations who may desire to disregard it. With such force available and usable, it is possible to educate the nations in other methods and effectively to use other means to prevent war. The mere act of nations conferring about the action to be taken concerning a nation who breaks the rule will have a wholesome effect. The nonrecognition of seizures of territory by force of arms is a new enforcement method for the Kellogg-Briand Pact. The Pact will become more thoroughly implemented as new means are devised and accepted to secure obedience to this new law of nations.

Unfortunately, we cannot discard within a few years an instrument which is as old as mankind. No more could we completely discard the horse in favor of the automobile, nor the scythe in favor of the harvester, nor the pen in favor of the typewriter, nor the local store in favor of the mail order house, nor the policeman in favor of local agreements to behave, nor the constabulary of the state in favor of the honor system among drivers of vehicles, nor the local militia in favor of arbitration between angry minorities of our people, nor armies and armament in favor of international councils and courts, all in any short period of time. Each will go along with the other until our human efforts gradually supplant one with the other in so far as practical limits will permit. If the new instrument fails, we shall temporarily of necessity turn back to the older one in spite of our desires and ideals, but we shall not on this account abandon the ideal.

Our intentions are clear. We are hopeful that they will not be paving stones on that much discussed roadway of perdition. In order that they may not be used in this manner, we must retain full power to assist in their enforcement. An Argentine Minister once said to me in Paris, "I have ardent hopes that you and England will maintain your great navies. There is no greater insurance to the safety of the seas. If you reduce them, the Argentine will have to pay more for the security of its commerce and so will all the rest of the world."

I am tempted to suggest a similar statement with reference to world peace, when I study the use of the developed power of the British Empire alongside the power of our country on the fields of France.

It is our privilege to hold the balance of power in our hands and with this privilege goes a heavy responsibility. The defeated nations of Europe think most sadly and bitterly of their defeat, their loss of territory, their oppressions, and their inferior positions in world life. In view of their many failures under new methods, they know of no means to improve their conditions except the age-old war method. Are we as a nation going to hold them forever in this purgatory by the outlawry of their only known method of return and by our control of the balance of power? We must take cognizance of this question and find means to correct injustice, if any exists, by new instruments to replace the one we discard. Our new means must soon be ready for important business or we shall find the old one remaining in use.

No government of any state under present world conditions could remain in office with the consent of its people if it seriously weakened the national security. Our government provides for our insurance at the best possible rate until the Kellogg-Briand Pact is sufficiently implemented to assure security and to permit us to lower the cost of protection.

I HAVE been asked to comment on the question, "Is it possible or desirable to prevent the invention of new weapons?"

The fear of the technical disarmament group seems to be that human ingenuity is very likely to unleash some force that will destroy us all. They feel that humans should be prevented in some way or another from seeking for such things.

They are inclined to forget that all life on this planet is supported on a system of balances. There is a control set up somehow in human society by which it advances in the conquest of the material world when conditions for advance are prepared. When an offensive genius is born, there appears also a defensive genius to counteract him so we do not completely annihilate each other, as we have so many times tried to do. Instead we have quite steadily increased in vigor and population as we have opened by our research new ways of life to support greater populations. Conferences like this one at Williamstown may be a part of that influence. Certainly some sort of control exists in the human body to prevent the human nose from reaching proportions of the elephant's nose.

It is possible that through some change of purpose on the part of that supreme controlling power, if we admit of a changeable Diety, there may be born more of one kind than another. Perhaps all males might be born for such a time that that race could not be replenished. Perhaps all offensive or destroying members may be born and society will destroy itself. I am rather inclined to believe in some sort of all wise Providence that provides males and females, offensive and defensive, destructive and constructive in the proper proportion.

By research into the forces of the universe, impelled by every motive, we have found means to bring mankind into higher life. Our history shows that by study of our natural surroundings we have been able to live where human beings never lived before, to travel space where humans never moved, to sustain ourselves upon products of the earth which were unknown in days gone by.

We must not stop invention or research into the endless mysteries of our surroundings. War invention has produced much of the mechanical and chemical advance of the ages. We have learned from the necessities of our preservation much of what we know in medicine, engineering, and even in art.

Let us believe in the eternal balances of nature a little more and go ahead with confidence and faith in a better world, rather than attempt to slacken our progress and to court deterioration and disaster.

THE new increase in the mechanization of our human society, naturally reflected in its war equipment, brings up at once that greatly discussed subject of aggressive weapons. Is the procurement of these new motorized mechanisms of war an indication of aggressive intent? Is the possession by the victorious nations in the World War of large caliber guns, aircraft and tanks, forbidden to the defeated nations, any evidence that further attack is intended upon the prostrate and defenseless? Or are the victors merely afraid of each other and likely to quarrel over the spoils of war? Or is the question merely one of insurance, already paid for by the people, being retained without greater cost until a safer world emerges?

If we are to reduce the cost of security by reducing armament alone, are we willing to reduce to such an extent that we will be unable to punish offenders against international rules of behavior? Such action must necessarily be aggressive. Whether or not we are ever able to define aggressive weapons, it is doubtful whether world conditions warrant their abolition.

The principal disadvantages of the question of limitation of aggressive weapons lie in these directions—

(a) Each nation holds to calibers of guns corresponding to its own stocks on hand, to prevent loss of insurance already paid for.

(b) Each nation holds to types best fitted for destruction of the particular obstacles it is likely to encounter in its offensive or defensive action.

(c) Some nations have built their military systems upon speed of mobilization and maneuver to defend themselves by attaining an initial advantage and have provided calibers of weapons to do this. Others prefer to occupy fortified areas or strategic points and await attack. Each requires different calibers of weapons.

(d) Some nations feel that minorities may seize control of local strongholds from which they can only be driven by heavy artillery. Insurrections in Portugal and in the South Americas have verified this contention.

As to the definition, there is room for endless argument. Mechanization and motorization have made available rapidity of movement beyond any previous possibilities. Armies are able to cross boundary lines, to grasp strategic points, to circumvent fortifications, to carry battle to a wide variety of places by the use of modern railways, automobiles, omnibuses, trucks, and armored war vehicles. These things have come to be a part of our commercial life which is already too greatly impeded by political arrangements. If we are thinking only of the military stocks in the nation's arsenals from the pistol to the heavy railway artillery weapons, after all, each of these had an important place in defensive warfare conducted in France, and will have a place in any future defense on a large scale. The disarmament of Germany furnishes no example of value, for French officials have already stated that Germany has been deprived of many defensive arms. The word aggressive is not definable as a basis for reduction of arms.

If I may interpose my own suggestions, I recall that over many years the nations agreed to use no dumdum bullets, to use no explosive in projectiles under 37-mm. caliber. Could we not extend the calibers in which explosive is used? Perhaps a few millimeters at a time? Could we not agree to limit the amount of energy which a cannon may be produced to deliver in a given time? Could we not limit the horsepower of tanks, armored cars and similar war machines? Can we not make similar definite limitations on armament that would not strangle any nation in caring for its interior safety and assisting in the preservation of world order? Such changes, made slowly enough to be accepted, would not be nullified when they were found to be advantageous.

In order to secure agreement there must be sacrifices somewhere in the national security and so far the sacrifices that have been offered, few indeed, are not yet sufficient to develop any sign of unanimous approval. Our President recently advanced a scheme, so simple and easy that all have given the matter serious attention. It is the proposal that many nations have feared, namely, proportionate reduction in effectives and arms. Each limitation of armament conference has been the occasion for considerable procurement of new arms lest the conference should try to freeze the situation existing at the time and begin reduction from the status quo.

To the new nations who have not yet accumulated arms sufficient for a condition of reasonable security in their opinions, this proposal has a serious aspect. Others claim that their standing or active military forces are no more than sufficient to maintain order at home. Any reduction in this category of troops would open the way for radical and other minorities to disturb the state in a serious way. Still others have in their stocks an excess of large calibers, valueless in domestic troubles in their particular states. Any reduction in all categories would give them to a few small calibers for domestic police action. Different balances of arms are demanded by different states. Germany has no desire to further limit her small military strength.

ANOTHER question has arisen at Geneva upon which I have been asked to comment, viz: (1) Equality of War Power. (2) Equality of Treatment.

Much thought has been given to the question of developing some kind of an equation whereby the total power of one country to make war could be equalized with that of another.

Somewhat in the same manner as race horses are given extra loads to carry to equalize their possibilities of winning. The simple form of this equation may be written—the military forces of one country plus its war potential should equal the military forces of the other country plus the other country's war potential. Thus, if one country has a high war potential it necessarily must have low military forces, and the other country having a low war potential should therefore have much higher military forces. This is a simple statement of the problem of equality.

In the first place it is very difficult to equalize military forces on account of the variety of systems. On the other hand, it is equally difficult to evaluate war potential. For instance, Czecho-Slovakia is a new country, not yet firmly established as a national entity. It has a definite Czech population, but it also has two or three million Germans who are suspected of harboring sentiments for the homeland. It also has a large percentage of Slovaks who are not as congenial as they might be with the Czechs, also Jews, Moravians, Ruthenians, Austrians and Poles. Czecho-Slovakia therefore in spite of its factories has a problem of taking care of conditions at home much more than another country with an established national spirit and a homogenous population.

On the other hand, a highly industrial country may have its major industries engaged in the manufacture of china, cloth and other materials not applicable to war, and the factories are not readily convertible to the production of war material. There is a great question as to what is convertible and how fast the conversions may take place. On this account there was much argument at the Disarmament Conference and no definite evaluation has been advanced.

What for instance would we produce for the United States if we applied the equation of equality to make ourselves comparable in total war power to any European State; we, who have more automobiles, more trucks, more tractors, more railway material, more factories, more industrial horsepower than any nation. In many items we possess more than all of Europe. Our war potential is our industrial and agricultural life. Our necessary police organization to maintain order would more than unbalance the equation. No other nation could afford to support the effectives or armament essential to equalize themselves with our nation. The issue of equality of war power would increase the armament burden beyond the capacity of many states. We should have an increase of armament expenditure rather than a reduction. It has already been observed that states with great industrial capacity are more interested than any others in the reduction of armament.

I know of no equation that could possibly equalize the war power of any important states of the world, even France and Germany, or France and Italy without additional expenditures of great sums on the part of one or the other.

The real question of equality revolves around equality of treatment. Are the disarmed, defeated states to be allowed to resume their places in the family of nations upon terms of equality of opportunity and to support their places by military and naval strength? Their treaties of peace signed under the pressure of military force restrict them materially in any question of planning the future of armament, or indeed the future of the world. Their protests of unfair treatment go unheeded as long as they cannot support their opinions by the strength of their population with its appropriate organization and equipment.

Removal of treaty restrictions will permit and will force an increase in world armament which the Geneva Conference has undertaken to reduce. To properly balance the situation for less armament, the victorious nations must necessarily reduce their organized effectives and their arms by a greater amount than the defeated nations are allowed to increase theirs. Here is the sacrifice that the victors are unwilling to make, but until they make it there can be no reduction in world armament on a basis of equality of treatment.

These are the facts and we must take them as they are whether we like them or not.

IT might be inferred from what I have remarked on this subject that I am not in favor of the limitation of armament. On the other hand, I do feel that certain nations of the world are spending entirely too large a proportion of their income for their security. One needs only to visit some of the smaller countries of Europe and to see the number of men in uniform, the amount of drilling and training that is going on, the number of army posts and fortifications, or even to scan the expenditures for new material to know that some countries are spending very large appropriations of their national budget or of their borrowed capital to maintain their existence, partly due to the armament of their neighbors. For instance, if one visited Poland, which has open boundaries on every side, with hostile Germans on one side angered over the corridor that has been cut through their country and over the German nationals that have been included in the Polish territory; on the other side, the world's largest state being operated by a group of people who believe in world revolution and in destroying other governments, and on another side by angered Lithuanians, one would not wonder at the nervousness of the Polish state nor at its feverish attempts to develop arms and armament.

If one visits Vienna or Dantzig or Memel or Riga or Reval and witnesses the tremendous waste of the facilities for commerce built up through the past ages, rotting away because they have been surrounded by barriers preventing their use by the neighboring people, and one notes that these neighboring people have not enough money to build new ones to take the place of those facilities which are rotting, it looks as if the only means by which armament limitation would ever be reached would be by first adjusting the economic difficulties that have arisen due to the Versailles Treaty, and other treaties; by establishing again the natural flow of commerce to use the facilities that have been built up in the past.

There must be a new deal in Europe before any real armament limitation can take place and it must be based on economic lines rather than on folk lines or present national lines. I fear that if things are not straightened out in a better way in Europe so that people may live more happily, may earn their living with less effort and attain a real value for their goods, that all attempts at reduction of armament, no matter how solemnly the agreements may be signed, will be of little avail. We do not want the necessary readjustment of Europe to take place by war but if we do not take some other means promptly to adjust the difficulties that exist, I fear that another convulsion, upsetting the political lines that are now so unpopularly and uneconomically drawn, will some day occur, for no other excuse than that new lines whatever they be, could not be worse than those that exist.

Armament itself is not the basis of Europe's trouble. It is only the exterior evidence of interior maladies, which are causing great suffering to the affected states and to the world.

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Liddell Hart on War

Lessons, Past and Present, in The British Way in Warfare

By Donald Armstrong*

IT is unfortunately true in our country that labels often count for more than contents. Consider, for example, the military critic. To gain a hearing many will insist that he be properly labeled. If he is not an officer of high rank, or is not a professional soldier, or has not grown grey in the service, many are inclined to shrug their shoulders at his opinions, especially if they run counter to the accepted military dogma of the moment. They ignore the remark of Clausewitz that "in the late war (the war of 1814) many men made themselves conspicuous as skillful generals, often as generals of the first order, without having had the benefit of any military education." The same thing might be written of a brilliant military critic.

Military criticism has, moreover, been made to appear an esoteric affair, characterized too frequently by books and articles that nobody can possibly read without falling asleep. It is therefore no wonder that when we enjoy Liddell Hart's writings our suspicions are immediately aroused. He writes too well, and he's too easy to understand. We look him up in "Who's Who" and our suspicions are confirmed. He's only a captain, he's only 37, his military career includes only the four years of the war followed by retirement in 1927. Consequently, he must win our regard by the sheer merit of his work. And this he has done, not only among many military men and civilians in our own country, but in other countries as well. Whether or not his opinions are palatable, whether or not his analysis of the past can be accepted, or his estimate of the future believed, the military reader is sure to find a study of his work professionally valuable.

The student of military affairs should lay aside his prejudices, if they exist, and discern the merit that lies in the latest volume of Liddell Hart: "The British Way in Warfare" (London: Faber & Faber, Ltd., 1932). He will agree with some views, disagree violently with others, admire some opinions, and scoff at others. But at all events, he will be made to think about the lessons of military history and the future of warfare. Most important of all, he cannot fail to learn the important lessons that the art of war is changing as weapons change, that strategy is the art of applying national power as a whole for the purposes of war, and that as human beings carry on war the psychological and moral factors are of paramount influence.

IN this book, Captain Liddell Hart has summarized his philosophy of war. Strategy, tactics, technique of new weapons and their effect on the war of the future are discussed with the underlying thesis that "there has been a distinctively British practice of war, based on experience and proved by three centuries of success. But its growth was stunted by shallow thought and deformed by slavish imitation of Continental fashion." The British succeeded in the past because they made full use of "mobility and surprise." Not for them the teaching of Clausewitz that the principal effort should be directed against the main enemy forces. From the time of Queen Elizabeth the majority of Britain's successful wars were characterized by the attack on the enemy's weak points, or by force directed against economic objectives. The military effort on the Continent was always reduced to a minimum. Economy of force was insured by relying "principally on economic pressure, the most economical form of pressure." The historic examples cited apparently support this view of British strategy of the past.

In the decades before the World War there was a reorientation of British ideas on strategy. The doctrines of Clausewitz, as well as the close association of the British general staff with the French army prior to 1914, were responsible for this. Clausewitz had based his conception on Napoleon's campaigns, but Capt. Liddell Hart maintains he misinterpreted these campaigns, and develops some convincing evidence to prove his case. Moreover all European nations, except to a limited extent Great Britain, failed to study the American Civil War in which "the standard of generalship was high, indeed the highest since Napoleon." In a careful study of the strategy of this war in an essay entitled "The Signpost That Was Missed", the author concludes "On the higher plane an adequate study of the American Civil War would also have warned the General Staffs of Europe to expect and prepare for a long war, even though they hoped for a short war. The expectation might at least have encouraged them to reckon with economic factors, to broaden their studies accordingly, to facilitate the economic mobilization of the nation, and to give more research, more sympathy also, to new inventions which might turn the balance of a protracted war. It might have warned them of the danger of sacrificing big political advantages for immediate military gains, and the danger of antagonizing neutrals or of failing to enlist possible allies. Moreover, once the opening moves had ended in stalemate, they might better have appreciated that, in default of a fresh trap, economic factors would decide the issue. Realizing this they might have so guided the military effort as to strike, like Sherman, at the enemy's economic foundations or at the least to help the blockade in undermining that foundation."

Studies of past warfare should therefore not be limited to a few recent campaigns, nor should time be wasted in analyzing tactics of ancient battles, as this is useless. But we should investigate the psychology of earlier commanders and be satisfied with a broad outline of their plans and actions.

The French cult of the offensive that led to the "fatally foolish war plan, Plan XVII" is harshly criticized. While this plan was being perfected there were two voices crying in the wilderness—Mayer and Grouard—deprecating the idea of an initial offensive and foreseeing very accurately the characteristics of the war. But the efforts of these two officers were in vain, and their objection to the prevailing views of the general staff resulted only in their failure to advance in their profession. Apropos of this, the author remarks: "all War Offices have had a warm corner for tame eulogists, who could rely on being well fed and watered. So were their comments."

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FOLLOWING this study of British, French, and American Civil War strategy Capt. Liddell Hart undertakes to formulate a strategy of his own applicable to modern warfare. In the 18th century there was too much of the cautious spirit of Marshal Saxe summarized in these words: "decline the attack altogether unless you can make it with the advantage." The other extreme of our own day was the offensive at any cost. The author would seek the golden mean between these two extremes and concludes: "To overthrow the enemy's armed forces may still be the quickest and most effectual way to cause the collapse of the enemy nation's will to resist—if it can be achieved. But the new civil conditions provide a far stronger argument against attempting it unless the military conditions are highly favorable to its success. The civil conditions give the strategist not only an alternative channel of action but an additional lever towards his military aims. By threatening economic objectives he may be able both to distract and dislocate the enemy's military dispositions, while the greater frequency and sensitiveness of such quasi-civil objectives make them more difficult to cover, and give him more oportunities to slip past the military shield and strike at them with decisive results. This potential development of strategy is greatly favoured by the advent of the air weapon, which introduces a third dimension of movement, and thus incalculably enlarges the scope for surprise. Aircraft came endowed with a knight's move to supplement the military bishops and rooks on the chessboard of war." So much for strategy. What does Capt. Liddell Hart foretell about the tactics of the future?

When new machinery puts thousands of men out of work in a particular industry, there is loud wailing about technological unemployment. If, as Capt. Liddell Hart believes, machinery can effectively replace men in battle, there will be no tears shed either by the men displaced or by the government employing these men. Economy of human lives and post-war economy in pensions and bonuses are such desiderata that replacing men by machines might be urged for these reasons alone. These new machines mean new tactics and more effective maneuver. In this domain Capt. Liddell Hart is a fearless innovator. From the point of view of the military conservatives (that is to say, the great majority of us) many of his views of the future are unorthodox and heretical. We should be decidedly open minded in this field, however. There are precedents galore for the surprise of the military mind at the results on the battlefield of introducing new weapons. This surprise may be explained by the fact that targets on the range are inanimate. They are not flesh and blood. How the nerves of human beings will be affected by new weapons nobody can tell. And so in war after war the predictions of military leaders have proved wrong. Nobody guessed what the breech-loading rifle would do to tactics. Everyone was unprepared for the devastating effect of the machine gun. The short war that all the European nations prepared for in 1914 dragged on for over four years. In other words, after the event most prophets of war have been quite properly without honor in their own country and in every other country as well. Conclusion: to be dogmatic about the future of warfare is a dangerous business, and to be open-minded is highly desirable.

CAPT. LIDDELL HART has his own views on the future effect of gas, aircraft, and tanks. "The possible use of mustard gas in another war", he writes, "is another hindrance to the use of armies composed of infantry, for to be secure against it an infantryman must wear not a respirator but a complete diver's suit, in which movement would be impossible. And if a man cannot move he cannot fight, except sitting in a trench. Mechanization is the only solution. For to infantry armies, a stretch of country sprayed with mustard gas will be as complete a barrier as barbed wire has been to the infantry unit. Only in tanks and similarly protected vehicles will man be able to manoeuver freely in a theatre of war where gas is employed." Of aircraft he writes: "The advent of air attack has given a new meaning and a new force to Marshal Saxe's acute verdict two centuries ago—that 'multitudes serve only to perplex and embarrass.' Yet in 1930 we still find most nations placing their trust in weight of numbers, while even those who abjure large conscript armies do so for political rather than military reasons, and maintain their own professional armies on the traditional pattern. As smaller replicas they may suffer less, but can hardly effect more." He is not enthusiastic about the super-heavy tank, but thinks that "a more promising line of tank development, and, in my opinion, the trend of the future, lies in the direction of the miniature tank, built mainly from commercial motor parts, so that cheapness in peace and quantity production in case of war can be ensured. This line was initiated in England with the experimental 'one-man tanks' of 1925, invented by Martel and Carden. Since then much progress has been made, and although they now have a crew of two they are still so small and low—lower than a man's height—as to be almost invisible targets, whilst their improved performance is obtained at a cost which according to type, varies between that of a Buick and a Rolls-Royce touring car. In mass production it would, of course, be reduced. Now fitted with a rubber-jointed track, which needs no lubrication and has practically no wear, these light tanks have made journeys at an average speed of nearly thirty miles an hour, and can attain maximum speeds fifty per cent higher. Within a few years one can foresee the advent of light tanks capable of sixty miles an hour." (See Army Ordnance, Sept.-Oct., 1932, pp. 87-88, for a description of these tanks.) A battalion of infantry numbering a thousand rifles would have less fire power than a unit of fifty light machines of this description. Other advantages of the light tank group over the infantry battalion would be lower cost of maintenance and a multiplication of its fire power by reason of the rapidity with which it could be moved from point to point.

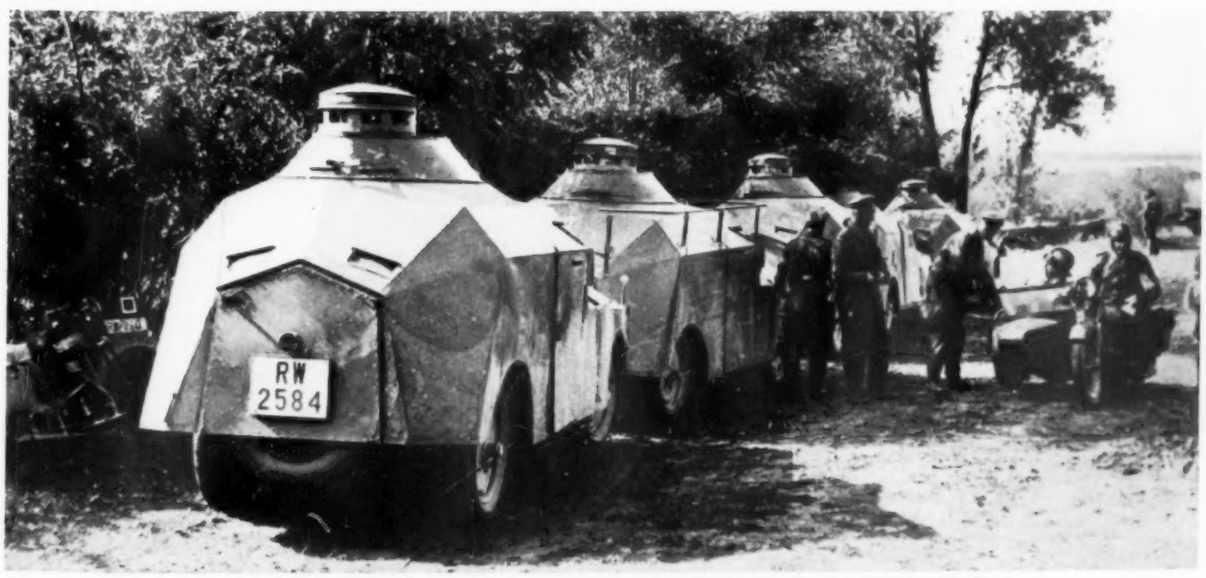
THE author distinguishes in his work between two forms of modernizing armies. *Motorization* is the first step and its significance in replacing animal transport by motor truck and tractor is readily understood. Such motor transport accelerates the movement of forces in the field. In his opinion the days of the marching army are numbered. *Mechanization* implies the use of armored fighting vehicles to replace unprotected men fighting on foot or horseback. Now mechanization has been delayed by two psychological obstacles in its path. There is the deeply imbued habit of thinking in terms of "man power." We do not willingly give up large numbers, even though we admit the value of fire-power and mobility. It should therefore not be surprising that in the British Army the tables of organization call for seven officers and men for each light tank, that was supposed to be a "one-man tank." That we have the same tendency of multiplying man power in our own army is well known. In France during the war we had seventy-five artillerymen for each gun. Capt. Liddell

Hart remarks apropos of this obsession: "The Air Force, having been born in a mechanical age, finds one man sufficient to fire a machine gun and pilot the machine which carries it. If it adds another man it adds another machine gun. But when one sees the man-power obsession of certain army minds one fears that if they had charge of the Air Force they would insist on every single-seater fighter towing a captive balloon with a basketful of spare pilots."

The other obsession is the search for the ideal. The technical man wants something 100 per cent perfect, where a machine that will meet 80 per cent of all conceivable requirements would be satisfactory. Then "bigger and better" tanks are likewise a menace to progress, for the supreme asset of invulnerability through smallness of target is thereby lost. Obviously a practicable solution of the mechanical problem must be preceded by a modified mental outlook.

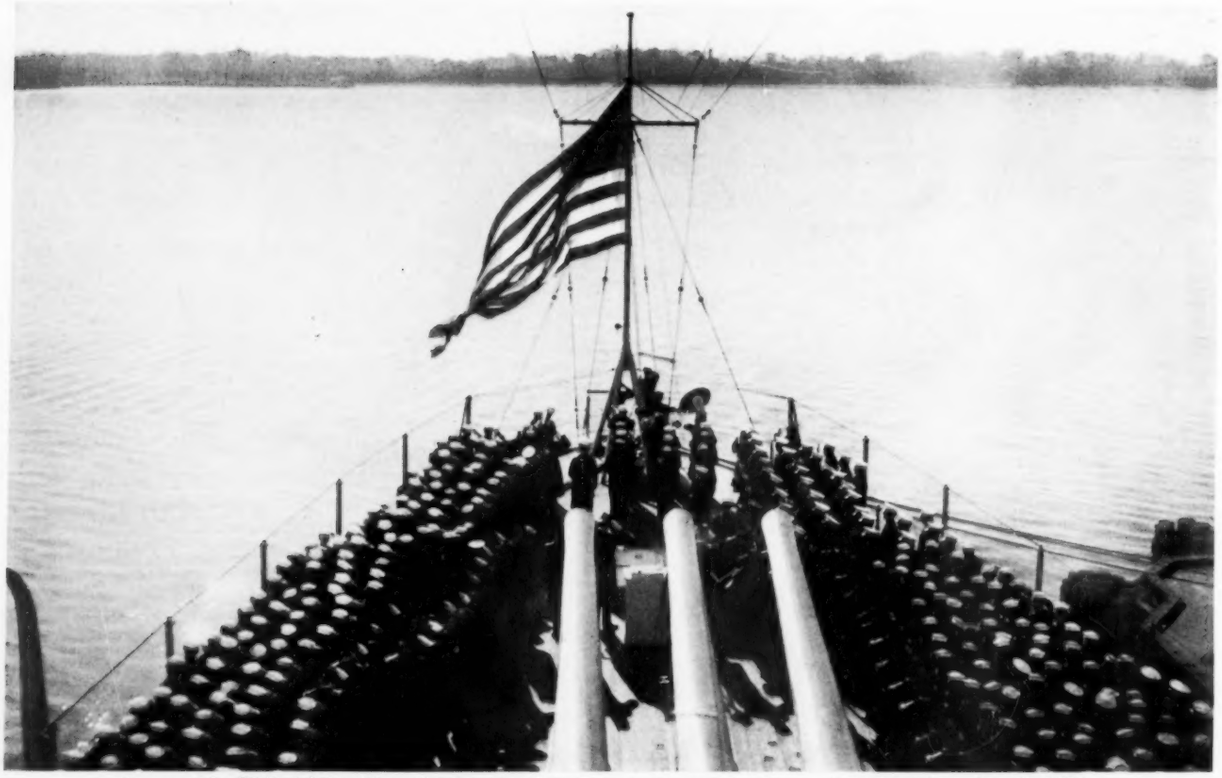
The author does not yet anticipate an entirely mechanized army. Consequently there will be two types of divisions in a suitable military organization. The armored division will take the place of the cavalry division of the past to furnish the strategic thrusting weapon. The cutting weapon will be the infantry division, but not as we know it. One of the best and most illuminating chapters in the book is a description of the mobilization of a war strength division in England in 1931. The immobility of this division with its mixture of motorized units and marching infantry was striking. Moreover to be able to attack under modern conditions, the division must be endowed with tanks and with more artillery. This demand for more organic artillery in the division is stressed repeatedly. The author is perfectly content to reduce the infantry of the division in order to augment the artillery, and regards it as an obvious economy of man power in battle, as well as providing a more effective weapon. When writing mainly of the armored division, Capt. Liddell Hart somewhat inconsistently expresses an opinion that will be contrary to that of the majority of artillerymen. He writes that: "As for the artillery, expert opinion is already inclining to the view that the day of and need for the existing field gun is past. Even drawn by a motor tractor it cannot keep up with the movements of a mechanized force or with the kaleidoscopic changes of a mobile action. To do this it must be mounted in a tank. But for such open fighting the present 18-pounder is unnecessarily heavy; a 3-pounder or, at most, 6-pounder gun, such as a tank already carries, may amply suffice. And against a well-entrenched position an 18-pound shell is not heavy enough for effect, as experience showed in the last war. Hence it seems likely that the artillery of the future will comprise two main classes: first, light guns mounted in tanks and absorbed into their organization; second, heavy tractor-drawn artillery."

A NUMBER of other military problems of interest are discussed in this collection of essays. Within the limits imposed it is not possible to consider them in this brief summary, which has been prepared at the request of the Editor of ARMY ORDNANCE. This review has been gladly undertaken because of a profound conviction that there is much of value in Capt. Liddell Hart's doctrines on strategy and tactics. In this rapid survey it should have been made clear that Capt. Liddell Hart does not believe in the large man power armies of today and yesterday. Why? Because the old-fashioned infantry attack is impossible in the face of the modern machine gun, air attack and mustard gas. He believes in the restoration of the art of generalship in war and that successful war need not mean holocausts of men and billions of dollars of debt. How? By developing armored mobile forces. We should never lose sight of the fact in reading this book, that Capt. Liddell Hart is writing about the problems of British strategy, and for the British Army. This does not mean that there is only an academic interest for the American soldier and defense student in his theories and recommendations. The United States like Great Britain depends on a small professional army and a body of citizen soldiery. For these and other reasons his conclusions are consequently not without great practical value for us. If these conclusions are sound, as there are many reasons to believe, it is evident that the Ordnance Department will play a more essential and important role in the future than even in the immediate past. In a war of matériel, the success or failure of our armies will be governed to an increasing extent by the technical skill of the Ordnance officer, by the soundness of our industrial mobilization plans, and by the coöperation of American industry in the complete fulfillment and realization of these plans in peace and in war.

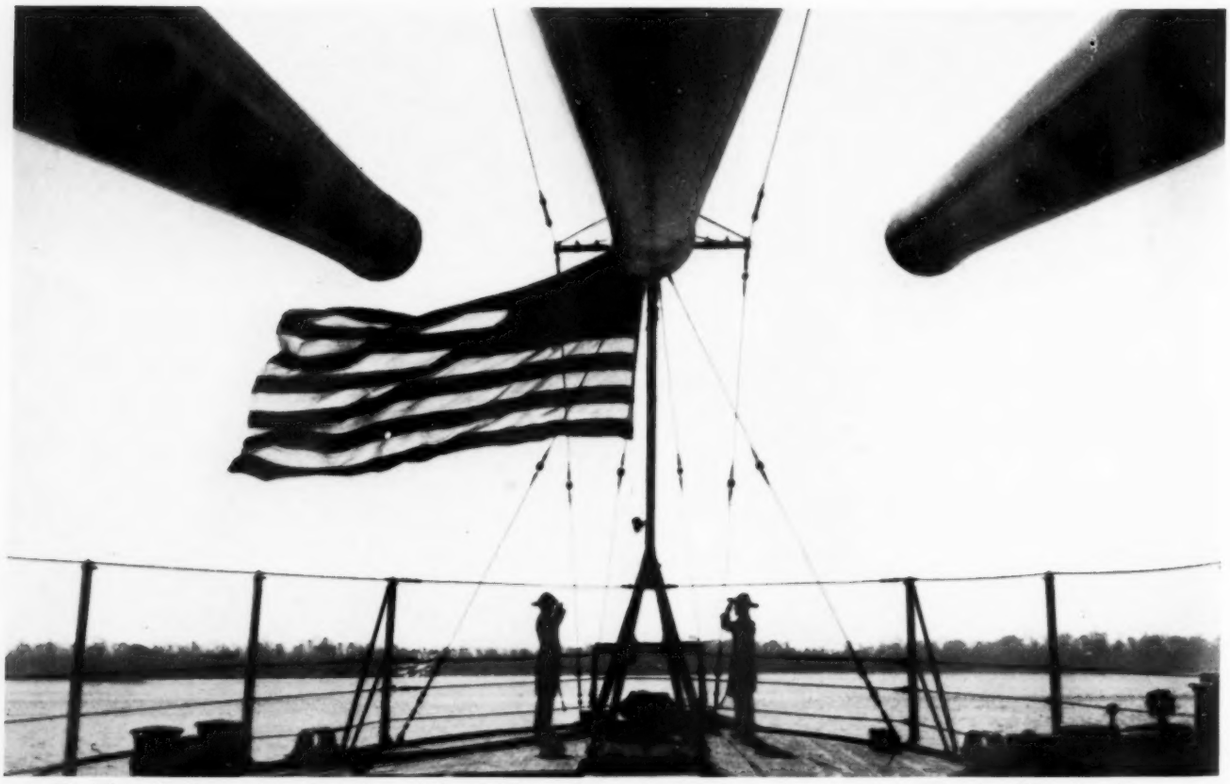


Unarmored Armored Cars of the German Army During Recent Maneuvers Near Berlin.

The Guns of Our Newest Cruiser



Scene at the Philadelphia Navy Yard as the U. S. S. INDIANAPOLIS was Commissioned, November 15, 1932.



The Flag, the Men and the Guns Aboard the 10,000-ton Cruiser, U. S. S. INDIANAPOLIS—Fastest Fighting Ship of its Type.

Priorities for the Nation in Arms

Munitions Production With the Iron Hand in the Velvet Glove

By C. B. Ross*

THE day was when warring tribes of certain savages at times each chose a champion and sent him forth to do battle for the right. Meanwhile, the others of the supposed-to-be combatant forces selected comfortable seats on the side lines to witness the encounter. When the duel was over both sides accepted its result as the will of whatever deities they happened to believe in and went home, thereby proving that possibly they were not so savage after all. At a later date nations selected armies to do their fighting while the remainder of the populace went about its normal affairs and preserved the established routine. Again, when one or the other of the armies was thoroughly whipped the party was over.

Both these days have departed never to return. Wars between armies have gone the way of the duels of champions and now nations at war are in fact nations at war. Every man, woman and child, every mine, every farm, every factory, every means of transportation, every other natural resource must devote its primary effort, and in some cases its entire effort, to the supreme task of winning the war. In his killing as in other things civilized man is more efficient and more thorough than the savage.

Just as modern war requires a general staff to develop an army in peace time and to control its operations in war, so there must be an organization for the control of industry, which supplies those things without which the army can neither fight nor acquire the training that will enable it to fight. This organization will be, of course, something quite different from a military general staff, both in its purposes and in its methods. Equally, of course, it can exercise no authority over industry in peace time. As a matter of fact, it can exercise no such authority in war time either unless the necessity for such control is manifest to the people of the country. Nevertheless, in the event of a grave national emergency there is bound to come the time when such control must be exercised or the armed forces will fail to get their requirements and, for that reason, will be unable to operate.

ANY organization for the control of industry, like any other control organization, must have a means of enforcing its decisions, either for the purpose of aiding and guiding that portion of industry which desires to coöperate but does not know how, or for the purpose of putting effective pressure on recalcitrants. Military control or any other form of direct compulsion may be dismissed at once as something entirely out of the question in any country whose citizens have the viewpoint of the citizens of the United States. Further, such compulsory methods, when applied to industry, always have failed to produce results, even when applied by autocratic governments to people more accustomed and more willing to accept governmental supervision. Therefore, any compulsion must be exercised through indirect and at least partially disguised methods.

This means of indirect compulsion is to be found in the system of priorities used by the various agencies for industrial control that were brought into being during the World War. It is simple, easily understandable and it has stood the test of experience in our own and other countries. It is the iron hand in the velvet glove, but there is a strong accent on "iron hand."

Possibly the most interesting feature about this system of priorities as it functioned during the World War (and as it probably will function during a future war) is that there is very little legal authority to support it. It was not illegal, but it unquestionably was to a large extent extra-legal. True, there is and was some legislation in support of the system, but it is at least doubtful if this legislation gave any additional authority to the executive branch of the government. In fact, it is entirely possible that these measures were a legislative attempt to curb what is termed, for lack of a better name, the "War powers of the President."

Just what the war powers of the President may be has never been set forth in any document and they may be stated as merely the exercise by the Chief Executive of the Nation of the rights and powers that are inherent in and inseparable from the sovereignty of the Nation. The exact distance the President can travel in the exercise of the Nation's sovereignty is the exact distance that the people will permit him to travel. That is something that will be determined at the time by the nature of the emergency and the state of mind the people happen to be in at that time.

The system as it developed during the World War was one of gradual evolution through the Clearance Committee of the Council of National Defense, the Priorities Committee of the General Munitions Board, the Priorities Board and ultimately the Priorities Division of the powerful War Industries Board as it finally was constituted. The one great thing to be said in its favor is that it worked.

PRIORITIES covered a wide field, determining when and where and in what order both military and civilian needs should be supplied. They were applied, not alone to the manufactured goods, but also to the materials, the power, the labor, the fuel, the facilities and the transportation directly or indirectly concerned in their manufacture or delivery. Priorities started new industrial enterprises, diverted both new and old industries into unaccustomed channels and stopped them. The greater part of this was accomplished in the manner to do industry the least possible harm. No industry was classed as non-essential and thereby destroyed. No industry was entirely deprived of anything essential to its industrial life, though in many cases the supply of such essentials was restricted, even greatly restricted, in quantity.

Priorities merely declared certain industries essential. When these came into conflict with those not so enumerated or with each other, priorities decided which should have the preference and the amount of that preference. The decision was based on considerations of national defense alone.

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These decisions found expression in requests rather than orders, and in the vast majority of cases this was sufficient, though there were a few who needed a bit of persuasion. A glance at the alternatives, having their fuel or transportation cut off or even having their plants commandeered, ordinarily was sufficient and the cases where actual resort to either of these stern measures was necessary were rare.

By the end of the war the Priorities Division, with its subsidiaries, the Priorities Committee, Priorities Board, Non-war Construction Section, Labor Section and Inland Traffic Section, was deciding questions of priority between the various departments of the United States government; the governments associated with the United States in the war; the United States government and the associated governments; the United States government and individuals; the associated governments and individuals; and between individuals.

THE matter now of interest is how priorities are to be administered in a future national emergency. To plan for this it is necessary to consider (1) what they are; (2) by whom they are determined; (3) when they are utilized; (4) how they are utilized.

By priorities is meant the system of preferential treatment given supplies and services that will insure (1) the prompt and orderly delivery of essential military items in accordance with their relative importance; and (2) compliance with civilian needs in so far as this may be possible after, and only after, military requirements have been met.

Military priorities of the Army and Navy are determined by the heads of the two armed forces in accordance with the existing special situation.

Priorities of military items for the use of the Army are determined by the General Staff or by the supply services functioning under the direction and control of the Staff.

Priorities of materials, fuel, power, labor, facilities and transportation required for the production of items in accordance with the General Staff schedule are determined by the Assistant Secretary of War or by the supply services functioning under the direction and control of the Assistant Secretary of War.

Priorities among the conflicting needs of the Army, Navy, other agencies of the Government and industry will be decided by such superagency as the President may have created for the purpose. Priorities must be utilized when (1) the supply is inadequate to meet the demand; (2) when the supply is adequate, but a conflict of demands requires decision regarding the order of precedence. The method of administering the system is by means of (1) rating of orders through—a. Automatic rating lists; b. Issuance of priority certificates in individual cases; c. Rationing; (2) rating of facilities.

The Assistant Secretary of War has the double function, placed on him by the National Defense Act, of "Supervision of the procurement of all military supplies and other business of the War Department pertaining thereto;" and "The assurance of adequate provision for the mobilization of material and industrial organizations essential to war-time needs."

To comply with these provisions of law, the Assistant Secretary of War must include among his planning duties (1) the creation and operation of an agency in his own office for the administration of priorities in so far as these pertain to the production of the Army's supplies; and (2) the adoption of a plan for the mobilization, but not the operation, of an organization for the administration of priorities in general to insure the adequate supply of all supplies and services essential to the winning of the war.

THE primary object of industrial war planning is to obviate so far as possible the necessity for priorities decisions after the emergency has arisen. By the peace-time computation of requirements, the surveys of industrial plants, the allocation of these facilities to the several supply branches, the placing with them of accepted schedules of production and the preparation of specific procurement plans for essential items and procurement plans for strategic and critical raw materials, the necessity for emergency decisions will be minimized. However, planning never can attain 100 per cent efficiency.

Every war has developed new devices and new methods and there is no reason to expect that any future war will prove to be an exception. The development of such devices and methods will result in radical changes in precomputed requirements and almost certainly will necessitate a certain amount of reallocation of facilities. Accompanying this will be the necessity of a redistribution of strategic and critical raw materials, power, labor and transportation. In all these changes priorities decisions will be involved.

By his organization the Assistant Secretary of War is prepared to control the production of the Army's requirements in accordance with the priorities of finished items prescribed by the General Staff so far as this may be possible without conflict with other agencies of the Federal Government. When such conflicts arise the Priorities Section, as the representative of the Assistant Secretary of War, will be prepared to present the Army's needs to the superagency empowered to make the final decision.

The present plan of the Office of the Assistant Secretary of War for industrial mobilization in war assumes that in a national emergency there will be created by the President a superagency for the control of industry and national resources, an agency that will have functions closely analogous to those of the War Industries Board as it was constituted at the end of the World War. One of the operating agencies of the superagency will be a Committee on Priorities which will have a mobilization membership of two representatives of the Army, two representatives of the Navy and two representatives of the United States Shipping Board. The chairman will be designated from the membership of the committee. This mobilization organization lends itself to expansion in any direction and to any size that the circumstances existing at the time may dictate.

The mission of the Committee on Priorities will be (1) to determine general policies governing priorities in procurement, manufacture and storage incident to procurement of supplies for the armed forces; (2) to establish priorities in conflicting requirements between the Army, Navy, Shipping Board and similar services, and between these services and civilian needs; and (3) to coördinate secondary requirements of contributing agencies.

No plan exists for the expansion of the committee to the point where it can comply fully with its mission and no such plan can be formulated until the emergency itself dictates the form this expansion is to take. However, with this organization mobilized when war begins or as soon thereafter as its need is manifest, the war administration of priorities can proceed at once with efficiency and a minimum of conflict.

Army Ordnance Medalists, 1932

Brig. Gen. John H. Rice

Graduate, United States Military Academy, 1893. Commissioned Second Lieutenant, 3rd Cavalry, 1893. Promoted through grades to Colonel, 1917. Brigadier General, 1918. Served during strikes at Chicago and at Fort Sheridan, 1894. Instructor of Mathematics, U. S. Military Academy, 1895-97. With Regiment in Florida, Spanish American War, 1898. At Manila 1901-03. Assistant to the Chief of Ordnance, Washington, 1906-12. Commanding Officer, San Antonia Arsenal and Chief Ordnance Officer of Southern Department, 1912-14. Chief, Carriage Division, Office Chief of Ordnance, 1915-17, which he reorganized and expanded and which placed orders and contracts for about $700,000,000 worth of materials and facilities for the design, procurement, inspection, test, issue, repair and maintenance of all special motor equipment, tanks and all classes of gun carriages for field, railway and coast artillery with their equipment and accessories. Chief, Engineering Division, Ordnance Department, 1917-18. Chief Ordnance Officer, American Expeditionary Force, 1918. Chief of Manufacture, Ordnance Department, 1919-21. Retired from active military service, 1921. Awarded Distinguished Service Medal; Commander of the Legion of Honor (France). Awarded Ordnance Medal of Merit by the Army Ordnance Association, 1932, "for meritorious service in the design, development and manufacture of military armament."

Frank A. Scott

Chairman, General Munitions Board and War Industries Board, 1917. Colonel, Ordnance Reserve. Chief, Cleveland Ordnance District, 1924-1928. Advisor to Army Industrial College, 1925. Director, Army Ordnance Association since 1919. Assistant Secretary and Secretary, Cleveland Chamber of Commerce, 1895-1905. Successively Secretary, Treasurer, Vice President and Chairman of the Board, the Warner and Swasey Company, 1909-1927. Director, Cleveland Trust Company, Ohio Bell Telephone Company. Trustee, Lakeside Hospital. Corporate Director, Case School of Applied Science. Trustee, Western Reserve University. Awarded Distinguished Service Medal "for meritorious services," 1919. Awarded Ordnance Medal of Merit by the Army Ordnance Association, 1932, with this citation: "for leadership and administrative ability in the progress of American munitions preparedness."

The Ordnance Medal of Merit

Brig. Gen. C. L'H. Ruggles

Graduate, United States Military Academy, 1890. Commissioned Second Lieutenant, 1st Artillery, 1890. Promoted through grades to Colonel, 1917. Brigadier General, 1918. Professor of Ordnance and Science of Gunnery, U. S. Military Academy, 1908-11. Author: "Stresses in Wire-Wrapped Guns and in Gun Carriages," 1916, originally prepared for the use of Cadets of the U. S. Military Academy to explain and illustrate the important engineering principles involved. Commanding Officer, Benicia Arsenal, 1911-13. Commanding Officer, Manila Ordnance Depot, 1913-15. Commanding Officer, Sandy Hook Proving Ground, 1915-18. Also Aberdeen Proving Ground, 1917-18. Chief, Inspection Division, Ordnance Department, 1918. Duty with A. E. F., 1918. Chief of Technical Staff, Ordnance Department, 1919-21. Assistant to the Chief of Ordnance and Chief of Manufacture, Ordnance Department, with rank of Brigadier General, 1923. Retired from active military service, 1930. Delegate to the Conference for the Supervision of International Trade in Arms and Ammunition and in Implements of War, Geneva, 1925. Awarded Distinguished Service Medal, "for meritorious services" 1919. Awarded Ordnance Medal of Merit by the Army Ordnance Association, 1932, with the following citation "for unusual accomplishment and outstanding service to the nation in the advancement of industrial preparedness as a guaranty of peace."

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Month by Month

Mental Disarmament

IT looks as if the popular (?) rage for disarmament has more than one alleged economic relation to the world-wide depression. The added connection is this: the war on hard times is being waged on many fronts, so is the war on armament. The proposal to scrap weapons which tend to make war less barbaric was an attack on a very wide front indeed but the assault now broadens still further to an attack on the mental outlook—a sort of metaphysical disarmament as it were.

The basis of this conclusion is to be found in addresses of Dr. Mary E. Woolley, president of Mt. Holyoke College, who was a member of the American delegation to the Disarmament Conference at Geneva. Dr. Woolley asks the men and women of America to make a psychological contribution to world peace by "disarming the mind." That is a big order although it is as commendable in motive as it is difficult and, as we see it, impossible to attain. The most blatant saber-rattler will not take issue with the idealism of mental disarmament. The most pacific pacifist will not object, we hope, to the intrusion of the idea in the realm of the mind. Both groups are extremists. But what of the "great unwashed," the plain, everyday folks who are neither ultrawarlike nor infrapeaceful? They are not to be scorned if their intuitive judgment is just as opposed to military disarmament in the spirit as well as in the flesh. At least they are not to be blamed if they resist an onslaught on reason—most precious of all their possessions.

We imagine that Mr. Citizen, typical of those plain, everyday folks to whom we have alluded, will have no hesitancy in being realistic in his handling of Dr. Woolley's plea. The man in the street has a way of assaying realities. His reasoning on this subject will probably follow three channels: experience—which the Latins held to be the best teacher; expediency—which statesmen hold to be a cardinal rule; and extravagance—which only fiction writers hold to be permissible. Singly and taken together these three are more than metaphysical stumbling blocks for the disarmament of the mind.

Mr. Citizen's objection based on experience is a little hard to get around. Being a man of plain tastes he begins at home, among his own associates where discord has been known to exist, where but for the proximity of the constable's night stick he might at times go to greater lengths than mere mouthy epithets. He broadens out and applies the gauge to the neighborhood and finds that his own circle is not a great exception to the general rule. He travels further and finds as he ascends the scale of social units all the way up to the nation and the family of nations that they are made up of plain citizens, some of small mold, others of large mold, but the same species nevertheless. There are millions of them, a good percentage of whom do go afoul of gentlemanly conduct despite the moral suasion of religion and education. Mr. Citizen concludes on this score—and we think rightly—that he will let the peace officer patrol his beat with auxiliaries to the night stick until the need has been shown not to exist. We do not believe he will assume that since most people want to be law-abiding they will achieve that lofty state by reducing the number of cops and depriving those who are left of their brass knuckles. Mr. Citizen has a fair education already so way back in his cerebellum is the knowledge that from Genesis onward "the life of man upon earth is a warfare."

Expediency is not a bad thing to keep in mind, this comely citizen will think while he wrestles with Dr. Woolley's mental disarmament. He has read in the books and the daily papers that war is seldom wanted by both parties to it but that being a unilateral sort of thing one cannot always dodge it. Furthermore, expediency is an unsettled quantity. When you have a corridor to the sea, or a canal joining oceans or a strait separating nations or the wide seas linking empires or a dummy state serving as an expansion joint, whether you have one or several of these, expediency has all the colors of the rainbow. It is a queer quantity, expediency. In six thousand years no one has yet been able to parcel it out with a yardstick. Certainly Mr. Citizen isn't going to try it. And he shouldn't be accused of sloth for the lack of effort.

But on the ground of the extravagance of mental disarmament—that's where you can't get away from the man in the street. He will tell you peace is a fine thing. He wants every effort made to preserve it. In his reaction to mental disarmament, however, he wants to know why the world doesn't disarm mentally first and when that works then worry about poison gas and tanks and bombers. He thinks it is a bit unnatural and therefore extravagant to reason thus: scrap the weapons first and then get in the frame of mind to scrap them. That strikes Mr. Citizen very much like another uplift movement on which his American fellows have recently expressed themselves quite distinctly. There the theory was first pass a law to dry up the country alcoholically speaking and then bring on mental temperance. Disarmament is in the same category, the state of mind is the big item of both. Having found a futile curb on reasonable enjoyment of the fruit of the vine and the grain of the field a monstrous thing because it attacked the problem from the wrong end, we American plain folks have put a rather high hurdle in the path of mental disarmament. We think it exorbitantly extravagant to rule out the implements of security—and we include every single one of them, the old and the new—on the pretext that the demand for peace will fol-

low. Invert the process and citizens everywhere will go along with Dr. Woolley. Otherwise mental disarmament is counter to good sense. If we twaddle over defensive and offensive weapons and scrap them in the hope of disarming the mind later, then we are going-off half-cocked again. And it's mighty costly business, so costly, in fact, that the mental disarmament game as it is being played isn't worth the security candle!

"Thank God for the Guns"

JAMES DUNN, of *The London Daily Mail,* has written the following epic on the 3-inch field gun in the Imperial War Museum, South Kensington. His inspiration came when on September 1 a group of men of "L" Battery, Royal Artillery, assembled to pay tribute to their gallant comrades—and the gun.

"It was not an ordinary gun, and they were not ordinary men. The gun that wore a wreath was one of the guns of the 'L' (Néry) Battery of the Royal Horse Artillery that on September 1, 1914, won great glory for that arm of the service that is known as 'the right of the line and the pride of the army.'

" 'The guns! thank Gawd for the guns,' was the fervent cry of the infantry voiced by Kipling before the great war gave us salvos of shells. And it was the guns that gave us our first thrill when 'L' battery, surprised by the Germans on a misty September morning in the dawn of the war, served and fought, their guns holding back a German advance through a murderous fire that dropped officers and gunners. But not a man held back in this Gethsemane of the gunners. One British battery against an army!

"The Major was shot down calling to his boys, the Captain took command and helped to load and fire until a shell cut off both his legs. The Lieutenants carried on until the shells and the bullets found them, and then the sergeants took command, using rifles and directing fire.

"Three guns were put out of action, but the fourth, served by wounded men, fired while the shells lasted; and then, when the dead and dying were grouped round the last gun, squadrons of the Fifth Dragoon Guards charged to the rescue, and saluted with their swords what was left.

"That was the stirring story told beside the wreath-covered gun in the Imperial War Museum. Only a gun, a very small gun as guns are known today, a cheeky gun with a shiny surface just like a cheeky boy with a well-scrubbed face. A gun with a grin. But some of us who wear the zigzag ties looked upon this wreathed gun not as an event but as an altar. This gun with the cheeky grin made us hold up our heads and straighten our backs."

Military Motorization

CAPT. B. H. LIDDELL HART has written for publication in the January-February 1933 issue of Army Ordnance a study of the maneuvers of the tank brigade conducted by the British Army this year on Salisbury Plain. It contains an analysis of some of the basic applications of the use of the motor in war. Pending its appearance a reference to other maneuvers notably those of the French Army during the past season of exercises are of particular interest.

Forty thousand men took part in the 1932 French Army exercises which were held on the same terrain where actual battle took place fifteen years ago. According to one observer motorization, coöperation between field forces and aviation, and camouflage were the principal items to receive close study. Camouflage has reached a point of high development in France. The Minister of War, Joseph Paul-Boncour, in expressing his pleasure at the progress in camouflage work, is reported to have said, "More than ever the art of war is to remain invisible." The maneuvers themselves were divided into two phases, the main object of the entire exercise being to study the employment of the *division motorisée* for technical composition and tactical employment against non-mechanized formations.

In the first problem the division was completely on wheels and occupied a road space estimated at seven miles. Trucks were used to transport the Infantry and the Renault tanks, field guns on solid rubber-tired trailers, tractor drawn, animals in open trucks and officers in 10 horsepower cars with machine guns. This organization attacked first a normal division and then a cavalry division partly mechanized. While the light tanks proved themselves superior in gaining contact, the French are said to have been somewhat disturbed by the serious problems in ammunition supply. A counter attack with the mechanized force guarded by aircraft was completely successful in overcoming the normal division.

In Italy, according to the *Army, Navy and Air Force Gazette,* Premier Mussolini addressed the troops after their annual exercises to test new tactical theories, the reorganization of the Army and new infantry weapons. The forces included five divisions organized into corps, reserve units, specialists units including tanks and air force squadrons.

Motorization in its broader significance is now receiving the attention its application to war demands. It would be well if our own meager setup were given an early opportunity to test it in simliar maneuvers in our own country on a fitting scale.

Ordnance Progress

FRANCIS MARKHAM, who at the age of 57 published in 1622 his *Epistles* on army organization, dwelt at length on the duties of the Master of the Ordnance, forerunner of chiefs of ordnance everywhere. The following quotation from Markham as it appeared in the *Journal of the Society for Army Historical Research* (London) is of timely significance: "He (the Master of Ordnance) is also to draw into his consideration the nature and qualitie of all Fortifications, and that they are made and framed as well to withstand the offence of Artillery, as to defend and keepe able themselves by the helpe of Artillery; and for this cause it is most necessary that the Master of the Ordnance bee skilfull in the knowledge of all forts and sizes of great Peeces, as whether they bee Royall (which are the greatest) or vnder Royall (which are the lesser) yet all to be imployed in the matter of Battery. The Royall are those which we call the *Culuerin,* the *Quarter Cannon,* the *Demy-cannon,* the *Cannon,* the *Double-cannon,* the *Cannon-Pedera* (a small piece of ordnance, originally used for discharging stones), the *Basilisco,* and indeed any peece which shooteth a Bullet from seuenteen pound weight or vpwards; and the Vnder-royall are the *Demy-culuerin,* the *Saker,* the *Minion,* the *Falcon,* the

Falconet, the *Rabinet,* the *Harquebusse a Croek* (an arquebus supported on a rest by a hook of iron fastened to the barrel), and indeed any peece which shooteth a Bullet from seuenteene pound weight downewards, and this Ordnance is the Master not onely by his authoritie and potents to prouide and raise, either by purchase, prize, or casting, as the abilitie of the place where hee resideth will affoard, but also to see them mounted either vpon Carriages for the field, vpon Bulwarks, Forts, Castles, Towne-wals, or any other place of defence or offence, as shall appeare best in his iudgement; and to this end he shall be of approoued iudgement in all manner of Fortifications, and able to direct the inferior Officers vnder him (as the *Lieutenant of the Ordnance,* the *Engine-master,* the *Trench-master, Captaine of the Pioners,* and the like) in the framing of *Bulwarks, Curtaines, Caualeros, Tenazas, Tizeraś, Dientes, Casamats, Teraplenes* (the earth that is rampired, and filled up unto the inside of any wall or bulwarke), *Trenches, Ditches,* or any thing belonging to their owne safetie, or the enemies annoyance; as also how to reforfifie any place that is decayed, or in the first erection by ill directions hath been made contrary to Art, whereby the platforme is to bee new moulded and reformed: and herein he ought to be capable of discerning (vpon a serious view) any hindrance and annoyance whatsoeuer, which shall accompany his worke, as whether it be without the situation of the worke, as if there bee hills, plaines, riuers, lakes, valleys, rockes, woods, vineyards, orchards, gardens, monasteries, old Churches, or any other Edifices, Seas, Isles, Bayes, or the like, or else within the situation, hauing regard to the wall, and euery quality thereof, the height and thicknesse of the *Terraplene,* the strength of the Gates, the depth of the Ditches, whether wet or drie, how waters are conuaid into it, whether by open and naturall channels, or by close and secret Conduits, the altitude of the place, as whether it be aboue or below other buildings that are about it, with a world of other obseruations; all which if they breed any annoyance or inconuenience he shall be able immediatly to reforme and cure, making the place safe and strong, howsoeuer Nature hath promised the contrary; and in this worke hee shall haue great care to husband euery thing as frugally as is possible, & to be respective ouer the Princes purse, vsing Stone where stone is plentifull, Bricke, where Bricke is made, and Timber, where Timber groweth; and where any of these are wanting to vse either strong Turfe or Earth, or any other matter which the place affoordeth."

It is not such a far cry from Markham in 17th century England to Hof in 20th century America. The article by our Chief of Ordnance in this issue of Army Ordnance brings the story up to date. The same thread is woven through both. The profession of arms is ancient with the ancients, medieval with the medievalists and modern with the moderns.

General Hof shows in general terms the work that was done in the past year. From a quantitative standpoint it is not formidable for the simple reason that it is not intended to be. It does not disclose the production of great quantities of arms. Our defense system is not built on any such *modus operandi.* It does show a vast performance in the study and experimentation necessary for efficient munitionment. It reveals the limited production required to keep the military establishment supplied with new weapons and with repair and maintenance of equipment in the hands of troops. Above all it reveals an esprit that will cause every friend of ordnance to share in the pride which is the Department's right.

Markhams lengthy sentence is replaced today by a much simpler formula. The duty of our Master of the Ordnance is to design, develop, procure, supply and maintain our military armament. By the record that duty is being fulfilled faithfully and efficiently. More than this is not asked.

The Time Factor in War

IN all the study and opinion so fully bandied about these days on the functions of an army in the event of war, few commentators know enough about their subject to really appreciate the most fundamental principle of defense, *time.* Always precious, time in war is the most valuable of all assets. By the same token, time squandered at the beginning of an emergency is a loss that may mean countless lives and millions of treasure tossed ruthlessly away.

It is this time factor upon which our entire preparedness structure rests. It has always been so with our armies and navies. It is especially so with industrial preparedness. It must be just as quick at the trigger as the sentry, just as fast at maneuver as the fleet.

Colonel Frank A. Scott, whose service in mobilizing American industry in 1917 is a byword to all friends of American munitions, again emphasized the importance of the time element in a recent address to the student officers of the Army Industrial College. "The element of time," he said, "that's the thing. You probably can make up the wastage of anything except time. Whatever happens to you, wherever you are, sail straight through on that. Once you have lent yourselves to the declaration of war, then do nothing and think nothing but fight; and as you of course know, that means activity and you must not, above all things, waste time."

If we are to see a further recrudesence of efforts to chisel away the strength of the Army on the plea of economy, legislators would do well to ponder the thought. For many of them and many of the everyday civilian pursuits time is not always held highly. For the soldier in war it is the great objective. At zero hour the charge goes over. On M day the wheels of defense are set in motion—no dillydallying, no uncertainty, no delay. A well thought out plan with trained personnel ready to start on an instant. Without that personnel at hand the time factor lengthens and as it does success or failure hang in the balance.

It is not for us in this place to preach. But Colonel Scott has supplied a text which contains the wisdom of experience. Its wording and its meaning should be etched deep in the minds of military students and even deeper in the hearts of the nation to a man. When it is there will be few in power who will dare reduce the military and industrial power of the nation to be ready—on time.

Poor Sir Basil Zaharoff

THE other day when an American citizen got into passport difficulties in Greece the name of Sir Basil Zaharoff, so-called mystery man of Europe, was mentioned in the press dispatches. He was referred to as the aged munitions baron whose tenacles on international armament reach around the world. Immediately veiled references to the devious, underground ways of the armament business were administered lefts and rights. And poor Sir Basil forth-

with was pictured as the diabolical impersonation of all that is treacherous in international relations. Simply because he appears to be a man who says nothing about himself and who at one time was associated with an armament firm the rumors, always with a tinge of irony at the war-lord connection, began to appear all over again. Some portions of the press would like the world to understand that these are unpopular days for anybody who believes in weapons.

The fact of the matter is that very little is known about Sir Basil although he is the subject of two books: *The Mystery Man of Europe* (Philadelphia, 1929) by Richard Lewisohn, a German journalist, and *Sir Basil Zaharoff, L'Homme Mystérieux de L'Europe* (Paris, 1928) by R. Mennevée. Seldom has such a mass of unconfirmed data been published about one and the same man. One author says his birthplace is Constantinople, the other claims Mughla in southwestern Anatolia. One says he is a Russian, the other says he is a Greek. In any event the good fortune that in early life he became associated with the Scandanavian firm of Nordenfeldt is described as "the first step in a long and colorful career in war supplies and munitions." In some circles a connection of this sort is almost as bad as that of a brewer!

Analysis of all the legend brings out the few known facts which after all are nobody's business but Sir Basil's. Among his benefactions are a gift of 700,000 francs to the University of Paris to found a chair of aviation, 1,000,000 francs to the "save-the-franc" fund and 200,000 francs to the French Olympic athletes in 1920. All the rest is shielded inference and fancy, mostly antipathetic, about an international armament game with Sir Basil the target of professional alarmists who whenever armament is mentioned see a ghost in every closet.

The silly thing about it all is that the mere mention of a private citizen who does not crave publicity and whose alleged fabulous wealth is supposed to have grown from the nefarious munitions traffic is reason aplenty to conjure up all sorts of tall stories of intrique and blood thirstyness. One does not know for a certainty what Sir Basil Zaharoff now in his eighty-third year has to do with the world at large and its armament. But the mere fact that he once represented Nordenfeldt is all that is necessary to put him in the class of munitions barons who prey upon mankind and foment war. Modern moralists are prone to go into a tantrum whenever a munitions traffic is mentioned. They liken it to the traffic in drugs on the theory presumably that both are habit-forming. Too bad that the day is gone when it was a habit to regard a weapon as a thing of solicitation and he who fostered it a man among men. The fashion now is to build unfavorable fiction about Sir Basil because he won't tell the world what investments enabled him to give 500,000 francs for the repair of the monkey house in the Paris Zoölogical Gardens. Poor Sir Basil! Or rather should it not be poor extremists who are so forgetful they do not know arms and the man, first sung by Virgil, still stand for much that is honorable and necessary?

It makes little difference whether Sir Basil as he is pictured is more legend than fact. He has become a symbol for attack among those who believe that since 1918 the world has become Utopia and the men who rule its destinies altruists of the first order. Propaganda for defense against war was never quite as insidious as the wiley ways of present-day proponents of military weakness as an instrument of policy among peoples.

Cutting the Coat to the Cloth

AT this writing the forthcoming budget of expenditures of the Federal Government for next year is in the making. There are many portents of major reductions in cost all down the line. A mounting deficit demands retrenchment. If the problem is faced in the direct way now urgently necessary the expansive and expensive cloak will be modified in the direction of the modest garment originally intended.

It is precisely in the modification process that the coat must be cut to the cloth. On innumerable occasions it has been pointed out in these columns that the first function of statehood is the national defense. The theme is an old one, the soundness of which all human experience strengthens. Our own brief history is a constant recurrence of the penny-wise-and-pound-foolish theory of national defense. It is slightly worse than that. We spend like inebriate sailors when the war clouds are on us and the minute the horizon begins to clear every nickel that goes to the defense services is complainingly doled out as a charge on past and future war.

Today in the quest for necessary retrenchment there are many of our people who survey the list of federal costs and conclude that the place for major saving after stopping the unconscionable charge of veteran disability not connected with service, is the Army and the Navy. That would be a colossal blunder. The dole by its new fangled name should go quickly. If there are places where the active services can economize any more than they are now doing those expenditures should go too. We doubt that there are such places except in those politically colored cases of obsolete Army posts. Certainly the personnel should not be penalized further, it is already on a 1908 pay basis. Neither should its strength be touched. Nor should its developmental and training activities be reduced.

One must be aware that in specifying these injunctions we are open to the charge that those who are interested in any particular activity of government want all other functions trimmed except the one of their particular concern. That is true but certainly friends of national defense have every reasonable ground on which to base their stand. If the facts must be stated, there is more reason for a sound defense policy today than ever before. High-minded statesmen are often times given to taking their jobs a little too ceremoniously. With a sweep of the hand they have been known to scrap fleets while others tossed blueprints out the window. They have been known too in a magnanimous gesture to write treaties under which it is literally forbidden us to augment certain insular possessions by as much as a seacoast gun. A little less thoughtlessness of this kind and a little more hard-headed self-assertion without the internationalist slant would have given us a degree of preparedness at much less cost than we are now paying for much less security. The old blurb that the munitions-makers (wherever they hide in this country we have not yet found them) like to talk in veiled alarm will be made, of course. Let it be. But when the coat is cut he who would deliberately skimp the cloth of national defense to the point of further retrenchment of personnel and matériel will do it in the face of a decidedly definite need. For the current year the Army and Navy are costing $648,300,000, which is 16.5% of the total budget of federal expenditures. National safety suggests that these services were long ago reduced to the lowest possible point. Next to the public debt in stability should come the national peace insurance premium.

The Way It Is With Us

THE first annual report of Dean Ackerman of the School of Journalism of Columbia University is more than a recital of study courses on journalistic technique; it is in effect a survey of American newspapers. The appearance of this timely analysis offers an appropriate occasion here to digress upon the subject of the American newspaper treatment of national defense—particularly maneuvers and exercises where tactical and strategic questions are worked out, where military thought and study are of more than general interest.

The subject which is of real importance can be best explained by citing the following evidence from two leading daily papers of the world, *The New York Times* and *The London Times*. The first is from the enterprising New York paper of September 22, 1932.

"Camp Dix, N. J., Sept. 21.—Field maneuvres of the First Division, under the command of Brig. Gen. Lucius R. Holbrook, were concentrated in a strong forward movement along the line from Arney's Mount to Georgetown today in the theoretical offensive campaign against an imaginary enemy invading New Jersey from the coast.

"Military strategists observed the operations with critical attention as the division demonstrated its ability to protect the right flank of the First American Field Army and at the same time to strike the enemy a smashing blow. Reserve officers watching the 'battle' included Colonel Wallace Scales, chief of staff of the Seventy-seventh Division of New York, and Captain John Frick of Philadelphia of the 315th Infantry Reserve Regiment.

"The manoeuvres opened with an artillery 'barrage' by the First Field Artillery Brigade, under Brig. Gen. Ernest Scott. The First Brigade, under Brig. Gen. Howard R. Laubach, supported by the Sixth Field Artillery Regiment, advanced on the right as the Second Brigade, under Brig. Gen. Charles D. Roberts, supported by the Seventh Field Artillery, moved forward on the left. Platoons of Troop A, 302d Cavalry, covered each flank of the division, while the Fifth Field Artillery supported the attack from a position near Smithville.

"Army airmen of the Ninety-ninth Observation Squadron, under Captain F. W. Evans, made continuous day-light reconnaissances from the coast to the Delaware Valley. A fleet of tanks opened the way across 'enemy trenches' in advance of the Second Infantry Brigade at the climax of the manoeuvres. After a survey from the air by Colonel H. P. Hobbs, chief of staff, General Holbrook moved division headquarters to a grove near Birmingham."

Now let us turn to the London daily and see its treatment of a similar event. The following is from the *London Telegraph* of August 20, 1932.

"Has the public or the Government any real idea how terribly under-gunned the Army is in proportion to its infantry mass? Government spokesmen certainly have often dwelt on the way our Army has been reduced in comparison with others, and with even its small pre-war scale. There is much truth in these reminders. But there is a much graver and deeper truth that they fail to bring out. Perhaps because, lacking military knowledge, they do not realize it. For these statesmen speak of strength in terms of numbers, of man-power. Whereas in modern war, even against tribesmen, it is fire-power that counts.

"Does either the public or its Ministerial representatives appreciate how hopelessly inadequate is the fire-power of our Army for the conditions of modern war? Have they any perception of the fact that if the Army had to take the field as at present equipped it would be courting a second Somme? Nay, a worse one. For, inadequate as our artillery preparation proved in that tragic July 16 years ago, our artillery resources were much greater in proportion to the numbers of the infantry than today.

"An infantry division is still composed of twelve battalions. Yet to provide even a thin barrage, a barrage that might suffice to pave the way for the assault on an enemy who had had time to entrench, at least one gun for each twenty yards of frontage is required. And the whole artillery of the division can only provide such a barrage for one battalion—out of twelve! I wonder if these facts have been clearly pointed out to Ministers?

"Thanks to improved artillery methods, the divisional artillery may, after a short interval, switch its fire and provide a similar barrage for another battalion to attack under in turn. But this does not go far to solve the problem how the other ten battalions are to advance, or even to be protected while sitting still. The public has a hazy idea that tanks will do the trick, and that nowadays we have enough tanks to make up any underweight of shells.

"Does it realize that the Army has only one brigade of tanks? This would not go far to meet the needs of the five divisions of regular infantry that we still strive to maintain, let alone the fourteen Territorial divisions. And of that solitary brigade of tanks, only a fraction of its machines are sufficiently modern to be fit for active service.

"These searching reflections were around yesterday in watching the final exercise of the Guards' Brigade training, when part of them attacked a position on the Fox Hills that was held by the remainder. The fact that for once the defenders actually wired, entrenched, and camouflaged their position gave an air of realism to the test such as we rarely feel on peacetime exercises.

"The position was attacked in turn at different points and at a creditably brief interval by two other Guards' battalions, first the Irish Guards, and then, further to the left, by the 3rd Grenadier Guards. Both attacks were held to have failed, and it was the only reasonable verdict in the circumstances, although the whole artillery of the 2nd Division was used in turn to support these attacks, and skilfully applied. For this quantity of artillery only provided an adequate barrage on an 800 yards frontage, and could scarcely do more. Thus intact machine-guns outside this zone could take toll of the attackers. And it is highly questionable whether any other form of artillery support or preparation with that scale of guns could have scotched these hidden menaces. It needed little imagination to picture the swathes of these gallant Grenadier and Irish Guardsmen that would have strewn the battlefield if the hostile machine-guns had been firing live bullets. And the vision is dismaying in reflection.

"Yet here wise leadership had only committed one battalion at a time, and two in all. There are twelve in the division. And only forty-eight pieces of field artillery to cover and aid them. To launch more infantry would only have meant more and more useless slaughter. It was at least better that the remaining ten battalions should rest safely in reserve. But what is the value of such a vast surplus?"

Is our criticism of our way of doing these things versus that of the British well taken? We think it is. Readers of our daily papers are given a great deal of military ballyhoo to consume; our trans-Atlantic friends are given detailed discussion of principles, clearly explained lessons, and ballyhoo is missing. The question "why is it so?" is pertinent. The answer supposedly is that American readers are served meager portions because they want meager portions. They like those morsels to be of the three-minute variety or half-baked or medium rare or with the essence cooked away. Such a supposition probably is in error. There are enough defense-minded readers in this country to warrant sane treatment of defense studies by the daily press. Little wonder we are woefully weak in the proper conception of an army and its problems. That is because we are served sketchy accounts and as a consequence arrive at sketchy conclusions—the way it is with us. But one thing is sure: the American press is not to be blamed, it serves to its readers only what is served to it.

Our Munitions Procurement Policy

An Editorial

IT is difficult for the open-minded observer to read the report of a special committee of the United States Chamber of Commerce on the competition of the government with private business and not conclude, as the committee does, that the Federal Government is the center of a great dynasty of agencies competitive with private enterprise. From the operation of dairy farms to barge lines, from dry cleaning plants to cafeterias, from lithographing establishments to harness shops, the field of activity and therefore of competition with private initiative is almost as varied and as far reaching as the scope of business enterprise itself. All these govermental undertakings are free of taxation; often they are oblivious of amortization and depreciation, many are unconcerned with capitalization and return on investment. Some of the business enterprises of government set up a barrier to private competition that is not only unwise but decidedly unfair as well. We have been hearing year in and year out that there must be less government in business and more business in government. It is high time now when the squeeze of necessity is cramping every legitimate enterprise that government confine itself to those things only for which it exists!

Because the national defense is one of the few clear-cut duties of the Federal Government, the practices of the defense services must be viewed in a different light from such barnacles as farm boards, warehousing, barge lines and the publication of highfaluting zoölogical literature.

THE exhaustive report of the Committee sets down as its first principle "I, The Federal Government should not engage in any form of business or service except for purposes limited to those clearly necessary in the proper administration of governmental functions which are pursuant to the Constitution. Even for such purposes the Federal Government should not enter upon any business activity which, directly or indirectly, is in competition with private enterprise, unless there is a demonstration beyond a reasonable doubt that there is necessity in the general public interest." Hence the Committee recommends that "the government should not manufacture for its own use any articles which private enterprise is prepared to manufacture or undertake construction of any kind which private enterprise can perform for the government except in the case of (a) armament for the Army and Navy to which there may be elements of secrecy; (b) a limited number of naval vessels as to which there may be elements of time, secrecy or preparedness of facilities for war emergency; (c) money and stamps; (d) publications relating to the performance of governmental functions, and (e) work needed to keep prisoners busy." One of the governmental activities connected with repairs to equipment which the committee considers proper is the repair of "armament for the Army and Navy, under circumstances outlined above."

WHILE the distinction may be a minor one and indeed may be included within the committee's meaning, it seems that the policy for military armament should be restated something like this: Armament for the Army and Navy in peacetime should be produced in governmental establishments in limited quantities only, with due regard to the elements of time, secrecy and preparedness of personnel and facilities for war emergency. This policy has consideration for the national defense and contains none of the unfair effects of unnecessary competition with business. As far as munitions are concerned this is the policy which is now in effect and has been for many years. Peace-time production of large quantities of armament matériel is such an infrequent happening in government plants that it is a bit silly to suggest ways of limiting it. The Army, especially, always lives a hand-to-mouth existence during its peace-time operation and it is an energetic soul indeed who will get excited about the business.

If one were to attempt to state in a phrase the sound theory for the existence of our arsenals and their very limited output in time of peace it is simply this: The arsenals are training centers where the art of ordnance production is kept alive, where research and development are carried on and where repair and maintenance of matériel are assured prompt and proper dispatch. Experience has shown that in a major national emergency the capacity of our arsenals is about five per cent of the total ordnance requirement. Hence private industry must be relied upon for the balance. In an emergency industry will be guided by the small group of technicians of the arsenals.

THERE are two ways in which unwarranted competition in the field of ordnance procurement are assured. The first is of continuing application. That is the production of matériel in government operated plants—there are only six such Army ordnance establishments—should be only in such limited quantities as are necessary to keep the establishment on an efficient operating basis both as to personnel and facilities, all work over and above this minimum should be placed in the hands of private manufacturers, with due regard to cost to the Government, service, and quality of product. This with few exceptions is and has been the policy for many years. Under present circumstances there seems to be no good ground for any exception to this policy.

The second way of assuring unwarranted competition is through the medium of educational orders. The Congress would do well to pass the enabling legislation to allow this long-sought method of limited ordnance production. It has tremendous advantages for the national defense.

Federal procedure might well put in general practice a principle which has long governed the Ordnance Department of the Army: when a satisfactory commercial product can be obtained at satisfactory cost and of proper quality the needs of the service will be filled from that source. There is no waste or duplication in this principle: it is sound. To the credit of the Ordnance Department it must be said that in general application it has put the production of our military weapons on an economical footing. It has kept government in the business of armament where there is no commercial industry and in so doing it has kept business in government in order that the waste of duplication, and the loss of inferior product may have no place. Above all perpetuation of the art of the gun maker is guaranteed for our future security. It should continue to do so utilizing private facilities wherever and whenever it can—a sound munitions procurement policy.

Association Affairs

Fourteenth Annual Meeting

AS announced on page 143 of this issue, the 14th Annual Meeting of the Army Ordnance Association will be a real gala affair. The gathering will be held at the Union League Club in New York City on Wednesday, December 21, 1932, beginning with dinner to be served in the Hall of the Club at 6:30 P. M. The dinner will be in compliment to Hon. Newton D. Baker, Secretary of War 1916-1921, who will deliver the principal address, and to the Army Ordnance Medalists for 1932: Col. Frank A. Scott, Brig. Gen. John H. Rice and Brig. Gen. Colden L'H. Ruggles.

The program for the meeting, which will be held immediately following the dinner, will be as follows: Introductory remarks by Brig. Gen. Samuel McRoberts, Chief of the New York Ordnance District and President of the New York Post, under whose auspices the meeting will be held; presiding officer, Brig. Gen. Benedict Crowell, President of the Association; addresses by Mr. Baker and Mr. Alex Dow, Chief of the Detroit Ordnance District; presentation of medalists by Col. Charles L. Harrison, Chief of the Cincinnati Ordnance District and chairman of the Association's Committee on Awards for 1932.

The assigned officers, advisory board and manufacturers of the New York Ordnance District will assist at the meeting. Ordnance officers assigned to the Second Corps Area have also been invited to participate as also have the officials and assigned officers of the corps area concerned with the supply and maintenance of ordnance in the field. The New York Post of the Association, the largest in point of membership of the several posts, will be in charge of the arrangements.

Requests for reservations for the dinner-meeting at $3.50 a plate should be sent prior to December 18th to Lieut. Col. Charles G. Mettler, Secretary, New York Post, Army Ordnance Association, Army Building, 39 Whitehall Street, New York, N. Y.

Preceding the annual meeting of the Association the officers and directors of the organization will hold their annual meeting on the same date beginning with luncheon at the Union League Club at 1 P. M. While it is customary for this meeting to be held after the close of the calendar year, its date has been advanced to coincide with that of the annual meeting. There are many matters of exceptional importance to be discussed by the governing body this year and a large attendance of members of the Board is indicated.

Philip H. Gadsden, Chief, Philadelphia Ordnance District

ANNOUNCEMENT was recently made that Mr. Philip H. Gadsden, President of the Philadelphia Post, Army Ordnance Association, had accepted the appointment as Chief of the Philadelphia Ordnance District succeeding Mr. John C. Jones who had occupied that post with great distinction during the World War and since.

Mr. Gadsden assumes his many responsibilities with a thorough understanding of their importance. He is the scion of a family famous in American history. General Christopher Gadsden, a well-known leader of the Revolutionary period, designed the famous rattlesnake flag bearing the symbol "Don't tread on me," which was used by the Colonial troops prior to the adoption of the Stars and Stripes. Another of his ancestors was James Gadsden who negotiated the Gadsden Purchase with Mexico securing for the United States a tract of land now part of Arizona and New Mexico.

Mr. Gadsden received his education at Porter Military Academy in Charleston, and he then attended the University of South Carolina, from which he was graduated in 1888. In 1918 he received the degree of LL. D. from that University. He was admitted to the bar of South Carolina in 1890. Later he became a member of the law firm of Mordecai & Gadsden, and was actively engaged in the practice of law for 17 years, and also served six years in the South Carolina Legislature. In 1907 he retired from active practice of law to manage and direct local public utilities. He became president of the Charleston Consolidated Railway & Lighting Company, operating the railway, gas and electric properties at Charleston, and was also Vice-President of the Charleston Light & Water Company furnishing the water facilities in Charleston.

Within a few week after the declaration of the World War, Mr. Gadsden went to Washington where he remained during the entire period of the war. As chairman of the National Committee on Public Utility Conditions he represented the interests of the railway, gas and electric companies in the United States in connection with their war problems. He was a member, and subsequently chairman of the War Board of the American Electric Railway Association. It was the purpose of the organization of these two committees to coördinate the operations and facilities of the various public utilities for the purposes of the Government.

In 1918 he was made Vice-President of the United Gas Improvement Company of Philadelphia, in charge of its Department of Public Relations, which position he now holds. In 1929 Mr. Gadsden was elected President of the Philadelphia Post, Army Ordnance Association.

Mr. John C. Jones, the retiring District Chief, has been a tower of strength in the ordnance preparedness movement for so many years and is so well known among members of the Association that all will regret his formal relinquishment of office. Were it not for the assurance that his interest and zeal will continue unabated his friends and associates would have cause for keen regret. He handled with consumate skill the difficult assignment as Chief of the Philadelphia Ordnance District during the World War. The gravity of that undertaking was in direct proportion to the large industrial and commercial activities that center in and around Philadelphia. He brought to the larger task of demobilization that high degree of fairness for the interests of the Government and the many contractors which marked ordnance settlements throughout the country. When the ordnance district system was reorganized and again made active on a peace-time basis, Mr. Jones carried on this important work to the point where the facilities of the Philadelphia area for ordnance production in time of war are well organized. In addition to these and his private business connections, Mr. Jones has always been untiring in the promotion of the Army Ordnance Association, having served on its Board of Directors for many years. In his relinquishment of his official duties his colleagues tender him congratulations on a job well done. They will continue to look to him as an able and willing counselor in the cause. Likewise they tender to Mr. Gadsden continued coöperation in carrying on this vital work.

Mr. D. C. Jackling Honored

THE John Fritz Gold Medal for 1933, highest honor in the engineering profession in the United States, was awarded recently to Mr. D. C. Jackling of San Francisco, a Director of the California Post of the Army Ordnance Association. He was in charge of the development of explosive plant facilities during the World War.

Mr. Jackling is widely known in the mining industry for his pioneer work in extracting copper on a large scale from ore containing as little as 2 per cent of the metal, an achievement which added greatly to the world's potential copper reserves. He received the Distinguished Service Medal in 1919 for his war service as Director of Explosives, a duty which he assumed in 1917 and held until the Armistice. He has also received the Mining and Metallurgical Society's Gold Medal for "distinguished service

in the development of low grade mines" and the William Lawrence Saunders Gold Medal presented by the American Institute of Mining and Metallurgical Engineers "for achievement in mining."

Mr. Jackling is a charter member of the Army Ordnance Association and served as a member of the Committee on Nominations of Officers of the Association for 1933-1934.

Robert S. Brookings

MR. ROBERT S. BROOKINGS, economist, philanthropist and educator, died at his home in Washington, November 15th. During the World War he served as chairman of the important Price Fixing Committee of the War Industries Board. Probably no greater tribute to his war service has been paid than the paragraph which appears in "How America Went to War," "His friends averred that he could ask more questions in a given space of time, and think up more angles of a subject about which to frame inquiries, than any other living man. When it came to the absorption of facts, Mr. Brookings was a human sponge. And it was just this quality which made him so valuable to an organization which had to meddle with a hundred and one industries and make determinations which gravely affected them. The investigations of the accountants, statisticians, and other employees of the Price Fixing Committee Mr. Brookings supplemented with his own rapid-fire of questions and with personal research which gave him great insight into the affairs under discussion."

In addition to the D. S. M. Mr. Brookings' war services were acknowledged by the governments of France and Italy which made him a Chevalier of the Legion of Honor and Commander of the Order of the Crown, respectively.

At the time of his death he was head of the Robert Brookings Graduate School of Economics and Government, which he founded, a trustee of the Carnegie Institution of Washington and the Carnegie Endowment for International Peace.

Membership Committee

MR. THEODORE E. MORITZ of Chicago continues to break all records in procuring new members of the Association. At this writing he has personally obtained 110 new members from among his friends and business associates. The Membership Committee takes this opportunity again to thank Mr. Moritz for his untiring and successful efforts.

The Committee is endeavoring to maintain the membership of the Association and ultimately to increase it. The objectives of the organization and the need for a growing body of supporters are constantly increasing and the Committee is most grateful to all members who are coöperating. The Chairman of the Committee, Lieut. Col. LeRoy Hodges of Richmond, Va., and his associates: J. E. McNary, New York, N. Y.; W. M. Moody, Berkeley, Calif.; George P. Slade, Providence, R. I.; Chas. Z. Tyron, Philadelphia, Pa.; E. D. Nims, St. Louis, Mo.; and James G. Cowling, Milwaukee, Wis., will continue to exert every possible effort toward a large and influential membership body.

Necrology

SINCE publication of the last issue of ARMY ORDNANCE notice has been received of the death of the following members of the Association: A. S. Baldwin, Stratford, Conn.; W. C. Coles, Baltimore, Md.; Herbert V. Coulston, Philadelphia, Pa.; C. C. Goodrich, York Harbor, Maine; C. A. Handschin, San Francisco, Calif.; Everett T. House, Farmington, Conn.; and Charles A. Root, Uxbridge, Mass. To the relatives and friends of these deceased members the Association extends condolences.

New Members

THE following have been admitted to membership in the Army Ordnance Association since the last issue of ARMY ORDNANCE: F. W. Bates, Princeton, N. J.; J. B. Black, Pittsburgh, Pa.; Augustus S. Blagden, Ambler, Pa.; Earl L. Brokenshire, Cleveland, Ohio; Donald L. Brown, Hartford, Conn.; T. M. Brown, Princeton, N. J.; Herbert F. Bruning, Chicago, Ill.; D. T. Buffington, Chicago, Ill.; John H. Cavender, Cleveland, Ohio; John J. Collins, Chicago, Ill.; C. Stewart Comeaux, New York, N. Y.; George W. Connors, Birmingham, Ala.; George J. Costello, Mount Vernon, N. Y.; H. E. Cragin, Jr., Princeton, N. J.; H. H. Cross, Chicago, Ill.; Charles M. Day, St. Louis, Mo.; Fred Denig, Pittsburgh, Pa.; William F. Disch, Milwaukee, Wis.; Joseph S. Fanning, Walker Park, Ga.; Morris Ferer, Omaha, Nebr.; F. E. Fike, Chicago, Ill.; Jack R. Forcheimer, St. Louis, Mo.; J. J. Fox, Chicago, Ill.; Norman W. Fox, Chicago, Ill.; J. E. Getzen, Birmingham, Ala.; F. L. Gibbons, Canton, Ohio; F. W. Foster Gleason, Washington, D. C.; Harry W. Grigsby, Chicago, Ill.; F. M. Hammond, Princeton, N. J.; E. John Hicks, Chicago, Ill.; Fred Hoener, St. Louis, Mo.; W. W. Holler, Aberdeen Proving Ground, Md.; C. L. Horn, Minneapolis, Minn.; Herbert C. House, Unionville, Conn.; S. P. Huff, Coronado, Calif.; J. O. Johnson, St. Louis, Mo.; Angus J. Johnston, Evanston, Ill.; H. L. Kirsh, Beaver Dam, Wis.; Joseph P. Langford, Chicago, Ill.; Bernard B. Livingston, Richmond, Va.; A. R. Ludlow, Mill Neck, N. Y.; M. J. McDonald, Boston, Mass.; John T. McEnroe, Chicago, Ill.; J. Irving Moore, Bridgeton, N. J.; Jules Muller, Chicago, Ill.; B. L. Newman, Cleveland, Ohio; Arthur M. Price, Chicago, Ill.; Louis F. Rahm, Princeton, N. J.; H. B. Ressler, Chicago, Ill.; William H. Richardson, Canton, Ohio; Forde C. Rickey, Chicago, Ill.; William Rosenthal, St. Louis, Mo.; Richard H. Rowland, Chicago, Ill.; W. Stewart Scott, Crafton, Pa.; A. A. Smith, III, Princeton, N. J.; H. W. P. Stanhope, New York, N. Y.; Hugh S. Taylor, Princeton, N. J.; J. T. Tierney, Pittsburgh, Pa; J. L. Tildsley, Jr., Chicago, Ill.; H. E. Townsend, Johnstown, Pa.; H. L. Tredennick, Johnstown, Pa.; Joseph van Ackeren, Pittsburgh, Pa.; T. C. Ward, Pittsburgh, Pa.; Everett W. Weaver, Ottawa, Ill.; Earl Whatley, St. Louis, Mo.; James D. White, Chicago, Ill., and LeRoy J. Zorn, Chicago, Ill.

Association Membership

OVER 90 per cent of the membership of the Army Ordnance Association consists of executives and engineers of American industry who are cognizant of the importance of industrial preparedness. These gentlemen who, through affiliation with the Association are kept informed of current development of munitions, constitute a large portion of the civilian nucleus upon whom our Government will depend for the manufacture of ordnance in time of emergency. The membership qualifications are:

"Article III, Sec. 1. Full membership in the Association shall be open to all men who are American citizens and who are interested in promoting the cause of industrial preparedness, particularly in connection with the design, procurement, production, manufacture, inspection, test or supply of Ordnance material.

"Sec. 2. Life membership in the Association shall be open to all men who are American citizens and who are interested in promoting the cause of industrial preparedness, particularly in connection with the design, procurement, production, manufacture, inspection, test or supply of Ordnance material.

"Life membership shall continue during the lifetime of the life member and shall expire at death. It shall not be transferable.

"Sec. 3. Student membership in the Association shall be open to all men who are American citizens and who are students in technical schools or colleges. Student members shall not vote or hold office in the Association.

"By-Laws. 5. The fee for life membership in the Association shall be One Hundred ($100.00) Dollars. The annual dues for membership in the Association shall be, for members, Five ($5.00) Dollars; for student members, Two Dollars and Twenty-five Cents ($2.25); and for group members, One Hundred ($100.00) Dollars, payable in advance. These sums are in addition to whatever dues or assessments may be imposed by the respective local posts in the case of members." Complete information will be sent to prospective members upon application to the Secretary.

Communications

Economy and the Army

The Editor:

I am indebted to Mr. Hoffman Nickerson for his letter commenting on my reply to him in the July-August issue of Army Ordnance.

Without desiring simply to obtain the last word, but rather to clarify my own position, it appears to me that what Mr. Nickerson has said to himself is indeed quite different from what he said to me in his recent article and in his previous writings. My viewpoint is influenced no doubt by long service under all sorts of legislative and executive ideas of what the military program of a democracy such as ours should be. At last when a definite program has been set up which, with proper implementation, appears to be capable of providing for national progress I find it difficult to agree with anyone who proposes a different system, and Mr. Nickerson does indicate a serious change.

There is no doubt in my mind that the United States is a young, growing, aggressive, and dominant nation among the world organizations of society. It has not reached a point of saturation or stagnation. If its past history is any measure of its future activity, its armies are likely to be found engaged in active effort far beyond its geographical boundaries. The mass army is the only form of military force contemplated by our Constitution and by our conception of a democracy. We are committed to such a system. The system must be able to satisfy the probable demands of our people.

The National Defense Act does provide the system. Mr. Stone has complained that it is not what the Army wanted or anyone else wanted at the time it was written. It has been interpreted into a better system than anyone proposed. Were it properly implemented as intended in its structure, and not emasculated by persistent reduction in strength, both commissioned and enlisted, we should have all the organized military strength that probable international situations may demand, ready at appropriate times.

Because the enlisted cut has been great, I am as anxious as anyone to secure a proper number of enlisted men to have the balance restored, but I certainly do not want to lose what training in military work our present corps of officers are striving to obtain in order to secure that balance.

Security conditions in our country are notoriously neglected in times of economic distress. Our Navy is deplorably deficient in comparison with its possible adversaries. Our Army is likewise laboring under great difficulties and with compensation below the standards of 1908. Yet world conditions are even more critical than they were in 1914. In times of peace, democracies tend toward division and disintegration. Danger is the great national integrator. Ought we not even in a democracy try to concentrate in times of peace upon the continuous security of the state along a definite workable line, such as has been established for us by the National Defense Act? I do not feel that in asking this, I have been conscious of any quasi-papal restrictions.

I apologize to my very worthy opponent in this debate for my question as to the sincerity of his attack upon our military program. I find that he is very serious about it all and so am I. I feel we are both indebted to Army Ordnance for the public presentation of our divergent views, and I am hopeful that new thought may be awakened which will offer ways and means for improving the military support of the nation.

Charles G. Mettler,
Lieut. Colonel, Ord. Dept. U. S. A.

New York, N. Y.

The Editor:

It is a pleasure to find in Colonel Mettler's letter as published above the prospect of common ground between us. He says of the National Defense Act: "were it properly implemented as intended in its structure, and not emasculated by persistent reduction in strength, both commissioned and enlisted," all would be well. Alas the persistent emasculation has resulted from the need for economy, and now that that need is trebly great, we shall certainly have either more and worse emasculation or a new and more modest plan. There is no third alternative.

At the moment the United States is like a family unable to keep in repair the house in which they live: either they must move into a smaller house which their diminished revenue will permit them to keep up, or they must resign themselves to an increasing number of broken window-panes and leaks in the roof. The plain fact is that since most of our taxpapers are busted, therefore every government department must retrench. To say that even deeper cuts could and should be made elsewhere (Veterans' Bureau, Farm Board, salaries of Civil Servants, etc.) is true but irrelevant.

Turning from Colonel Mettler to Mr. Edward L. Addison, whose letter was published in the September-October issue, the latter is certainly right in saying that personnel should be transferred from the "obsolescent" branches to those more suited to the needs of present war. The difficulty is to find a branch which admits itself obsolescent. Cavalry would seem to be largely so, but even then there is an argument for retaining some mounted troops: every theatre of war has patches of country better suited to the horse than to mechanical transport, and some theatres demand the horse. On the other hand, this argument has its limits, because most of the horse-theatres seem unlikely to be the scene of operations decisive of the fate of the United States.

Hoffman Nickerson.

New York, N. Y.

Possibilities of the Tank

The Editor:

In closing the series of articles which appeared in Army Ordnance under the above title, I said it was hoped they would lead to a "non-partisan, honest, truthful and constructive discussion," which was one of the principal reasons for their preparation. The articles were written with a view to the possible service of tanks in our own country, irrespective of what might be expected of them in other lands where one country borders so closely upon another, and with the hope that United States forces might never be called upon again to cross 3,000 miles of ocean to fight battles on foreign soil.

So much one-sided information had been published regarding tanks, that the man on the street in many cases had reached the conclusion that some few thousands of these new implements of warfare were all that was necessary to win a battle. In view of this, I felt it necessary to depict the other side of the picture, in order that this same man might be given an insight into what had happened and what might be expected in the future. The desire for disarmament was, and still is, so strong in many quarters, that the thought of constructing thousands of tanks to replace other integral parts of the Army was gaining headway to an extent which required a stop, consequently I gave the pictures presented by tank actions in the World War. This gave rise to the term "Wagneritis," which General Fuller states in his criticism published in the last issue of this Journal is a "universal complaint, and one which has confronted the inventor throughout history." If I have accomplished nothing else, I am at least responsible for the coining of a new word. I am, however, extremely grateful that I am not accused of "dishonesty," but only of still retaining the mind of "the old enemy, the G. H. Q."

My criticisms of the tanks in action during the World War, and the results obtained with and without tanks, is answered by General Fuller with excuses why they did not accomplish all that was expected of them. A case of "Man proposes, but God disposes,"

or, in other words, all the well-laid plans of the Tank Corps, of which General Fuller was Chief Staff Officer during the World War, were negatived by G. H. Q. or some other higher-up, and consequently the results obtained were not all that had been desired. This is a sad commentary on all the gentlemen who had been entrusted with high command in expectation that they, like Moses, might lead the embattled nations out of the wilderness. It is hardly a criticism of what I had to say although, if necessary, I am pleased to take my stand beside those who are so condemned.

Excuses for failure do not answer the facts, since they are made after the fact for the purpose of protection, and they seem to resemble what we, in the American Army, term "passing the buck." I therefore must refrain from answering in detail General Fuller's attacks on my statements, attacks formulated on excuses, and let the facts remain as a correct history of the war must record them.

As to my quotations, if I have failed in any case to give due credit to the authors quoted, I sincerely apologize for the oversight, since it was not intentional. I purposely selected British authors in the matter of quotations, and also to a great degree for sources of information, because England was the home of the tank and there the discussion between advocates and opponents of the tank had waxed strong. I might have added quotations and information from both French and German sources, but desired to confine my remarks, as much as possible, to the land where the tank had found its birth.

I must, however, refute the accusation of "misrepresentation," and the facts as related must stand by themselves in spite of General Fuller's desire to show that they should have been otherwise. I can readily understand General Fuller's attitude. He is a tank enthusiast, one who is not suffering from "Wagneritis," but rather from, to coin another word "Tankitis," a specialist's malady marked by the inability to see a rational course. He believes his extreme views are the only acceptable ones and should therefore be adopted by all others. The world, in my case, has not "apparently been standing still," nor has my type of "thinker always been wrong," despite General Fuller. I am seeking the truth, and therefore I studied the question from an angle quite the opposite of General Fuller with the hope that in this manner the desirable and rational course, as far as the United States is concerned, might be found.

I FULLY appreciate General Fuller's references to ancient history, his remarks regarding the stage coach, the steam engine, the locomotive, the steamship, the motor car and the airplane, but I do not feel that these are generic to the case in question in view of the facts presented. The World War ended in 1918, and in 1932 we find another war, although no declaration of war had been made by either party, being fought in the streets of Greater Shanghai and in the territory surrounding the city. Within the confines of the Chapei section of the city we find the use of armored cars by the Japanese in street fighting, but they were of little effect in this case. Here we may enter another "excuse," i.e., the streets were very narrow which, combined with the overhanging houses, made these cars a vulnerable target for bombs and hand grenades. This may be an excuse for lack of results, but the fact remains that the Chinese held the Japanese within these streets for weeks.

Finally, due to the landing of Japanese forces at Liuho, there was extreme danger of the Chinese being flanked by the Japanese, and the former withdrew their forces in an orderly manner for a distance of 12.5 miles from the city. This prepared the stage for open-country fighting, but in spite of the use of tanks by the Japanese, the latter made but little progress against the once "despised" Chinese infantry up until the day the armistice was signed. As stated before, the Chinese had but little artillery with which to repel tank attacks, but the tanks failed, from all reports, to accomplish their mission, which was to destroy machine gun nests and if possible break the Chinese lines.

It is no doubt true that the Japanese at Shanghai did not possess sufficient tanks to attack the Chinese lines in the manner advocated by General Fuller, and it is likewise true that the Chinese were lacking in antitank weapons as well as artillery. But I am informed they did employ antitank mines.

The "excuse" in this case may be accepted as being such impedimenta to tank maneuvers as canals, swamps and ditches, which compelled the tanks to confine their advance to roads. The excuse may be made, but in this case the Japanese G. H. Q. certainly did not refrain from giving the tanks freedom of action.

As regards the use of tanks in Manchuria, I would refer to the taking of Anganchi and Tsitsihar, or where the Chinese army of some 20,000 men, supported by 24 field guns and more than 100 machine guns, was put to rout by a Japanese army of 4,500 men accompanied by six tanks. A two-hour artillery bombardment opened the engagement, after which the six tanks advanced. Only one of these reached the front line, because the others broke down and were left stranded. The Chinese, in this case, did not wait for the Japanese to come within rifle shot before they began their flight. The tanks did nothing in this case to contribute to the Japanese success.

When the Japanese took Harbin, only one tank got into action, but not for long, since, after killing a few Chinese soldiers at close range, the tank toppled into a ditch and remained there until hauled out forty-eight hours later. It cannot be claimed that the tanks had anything to do with this victory.

Thus fourteen years after the cessation of hostilities in Europe, where the tanks had received their baptism, we find the failure of the tanks must again be bolstered by "excuses," since they contributed nothing to the victories, and in the case of Shanghai the Chinese held fast for some twenty-one days. The Japanese also employed airplanes to bomb the shambles of Chapei, but the XIX Route Army held fast in spite of them.

I am unable to find mention of a French 130-ton tank, but if General Fuller has found this item it is probably a typographical error.

As regards my statement that the amphibious tank was invented by Captain B. H. Liddell Hart, this was made in good faith, since it was so reported in several American newspapers as well as in the *Literary Digest*,, and was corrected by the Editor of ARMY ORDNANCE in a subsequent issue. My error and I apologize.

General Fuller writes: "We are told that at the time of the Armistice the Allies were short of supplies, this was not so. Never throughout the war were supplies more abundant, and this is proved by the enormous quantities sold after the war." If General Fuller will carefully read paragraph 40 of Article I, he will note I quote Major-General Maurice in part as follows: "had on November 11th reached or very nearly reached the farthest limit at which for the time being they could be kept *regularly supplied*," and further on, in the same paragraph, I said: "This, of course, refers to the *movement* of vast supplies," or quite different from General Fuller's interpretation, to wit: "the Allies were short of supplies."

I was not present when, as reported, Sir Douglas Haig, in his order of the day for April 12, 1918, as quoted by me in paragraph 9 of Article II, said: "There is no other course open to us but to fight it out. Every position must be held to the last man. . . . With our backs to the wall and believing in the justice of our cause, each man must fight on to the end." And this in spite of almost two years of tank experience.

In the last paragraph of Article II, I said: "The tank is a wonderful weapon when *properly used* and *supported*, and which was not usually done during the recent war, but this same war definitely proved that it had its *limitations*." I should suppose that this paragraph, except perhaps the last eleven words, would have met with General Fuller's commendation, and the last eleven words he might attribute as having been the fault of the G. H. Q., which latter he so readily condemns.

I do believe in surprise, in spite of General Fuller, and in

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Article III I said it was the very *essence of success*, but I am still convinced that surprising a vigilant army by means of a horde of tanks is problematical, providing the enemy knows more about the business of war than General Fuller credits to his G. H. Q. during the World War.

I do believe in speed, providing the coördination between the speed of the tanks and the other following forces is such that the tanks are not put out of business before they have the required support.

If I were within a tank I would "not like smoke." In the first place, the enemy must not be considered so stupid as not to know what this smoke means and consequently make preparations to receive what it conceals; besides this, he certainly will have an air force which can report on what is behind the smoke and the direction from which an attack by tanks may be expected. In the second place, one of the greatest draw backs to even the present-day tank is visibility from within, and although the smoke may be a flanking one "a mile long," there is still danger of this smoke confusing the tank driver, unless General Fuller possesses some unknown means for maintaining the smoke in a stationary position, which would imply that he has command of the winds.

Finally, "if an operation is impossible, to attempt it at all is the act of a fool," as declared by General Fuller, certainly is a sad reflection on the last stands made by heroic souls to enable a defeated army to escape the clutches of an advancing enemy, and of which British history contains many examples. Such acts may have seemed impossible, but they were heroically performed in spite of this, and were not "the act of a fool." Again, and also to recite some more ancient history, it may have been thought impossible that the British Army under Major-General Robert Ross, 4,500 men strong, which on August 24, 1814, routed the Americans at Bladensburg, entered Washington, destroyed public buildings and a few days later, while still flushed with victory, advanced against Baltimore, could be stopped and put to rout after a skirmish at North Point. Here two boys, armed with squirrel guns and hidden in the branches of a tree, shot and killed General Ross with the consequent retreat and reëmbarkation of an army which had so successfully raided the nation's capital. It seemed impossible, but was accomplished, and was not "the act of a fool." Coming to the present, the heroic stand of the Chinese garrison of the Woosung forts at Shanghai held the Japanese at bay for three weeks, and this in spite of both land and air attacks assisted by naval bombardments. This seemed impossible to the Japanese who daily reported that the forts had been reduced to a "scrap heap," but who on each succeeding morning found the intrepid Chinese still holding on, but it was not "the act of a fool."

In the above reply I have attempted to give my reasons for writing such "clap-trap," and I thank you, General Fuller, for calling to my attention all my "misrepresentations" and other departures from the road you would have me follow, but you have not followed my request to enter into a non-partisan and constructive discussion of the subject of tanks, but have given me "excuses" for what *might* have been avoided.

It is a well-known fact that all statements issued by specialists must be considered under the strong light of reason, because even specialists often disagree on a stated opinion, hence I must take all you have said as personal expressions which do not agree with actual facts as recorded by others who, no doubt, are just as capable as are you to visualize what actually happened, and not what should have happened if G. H. Q. had not unhappily been so terribly obtuse and unimaginative. In closing this discussion, at least so far as I am concerned, let me suggest that although the tank has undergone a vast improvement since its birth during the recent war, antitank weapons and defense have kept pace, or probably have outdistanced, these improvements. This is something which even the tank specialist must bear in mind.

Fred H. Wagner,
Col. Ord. Res., U. S. Army.

Baltimore, Md.

AOA

Professional Notes

Service Pistol Team Trophies

MEMBERS of the Army Ordnance Association and Ordnance Reserve Officers took a leading part in the award and presentation of team trophies and individual medals to the 1932 pistol and rifle champions of the Regular Army, National Guard and Organized Reserves of the Second Corps Area at recent ceremonies at Governors Island. Presentations were witnessed by Maj. Gen. Dennis E. Nolan, Commanding General, Second Corps Area.

Col. Cyrus Field Judson, Aux. Res., presented the Leonard Wood pistol trophy, of which he is the donor, to the Ordnance Reserve Officers' Pistol Team, winners of the branch unit championship of the Corps Area. It was received by Lieut. H. E. Hill. Another Ordnance Reserve Officers' team received the McNary Branch Team trophy, emblematic of the Organized Reserves' small bore rifle championship of the corps area. The presentation was made by Col. James E. McNary, Ord. Res., donor of the trophy. It was received by Maj. C. L. LeVien. Colonel McNary is a Vice-President of the New York Post and is a member of the reception committee for the forthcoming annual meeting of the Association. Other honors awarded were the Ball trophy, emblematic of the regimental corps area pistol championship of the Organized Reserves which was presented to the winning team, the 308th Infantry Reserve, by Maj. Edwin J. Mooney on behalf of Col. Julius Ochs Adler, its donor. The Rhinelander cup, donated by Maj. Philip Rhinelander, was presented to the New York National Guard Pistol Team, National Guard champions of the corps area, and was received by Brig. Gen. Frederick M. Waterbury who organized the team.

The Regular Army Pistol Team of the Second Corps Area received the Luquer trophy for its victory over teams representing the National Guard and Organized Reserves. Presentation was made by Col. Thatcher T. P. Luquer, donor of the trophy.

Standard of Conversion—Inches to Millimeters

AN American standard value to be used by industry in converting inches to millimeters was recommended by a general conference held under the auspices of the American Standards Association on October 21, following a request of the Ford Motor Company. Representatives of 18 industrial groups having an interest in precise measurements and methods of limit gaging were present. The conference unanimously recommended the conversion factor of one inch equals 25.4 millimeters to become the American Standard value for industrial use, replacing for this purpose both the official ratio 25.40005 and the rounded value 25.4001 given in certain handbooks and tables.

The official British ratio is 25.399978, and the last precise experimentally determined value 25.399956. Thus the British official value is about one part in a million below, and the American official value about two parts in a million above 25.4. British industry, through the British Standards Institution, adopted the value 25.4 for industrial use in 1930. This simple ratio has been advocated by continental European countries.

The adoption of the conversion ratio 25.4 by American industry will secure world-wide uniformity in conversion practice. For example, an American automobile manufacturer having plants in both metric and inch countries, desiring to have complete interchangeability of parts regardless of the country in which they are made, can use identical blueprints in the respective countries on the basis of the uniform conversion ratio 25.4 of American standard.

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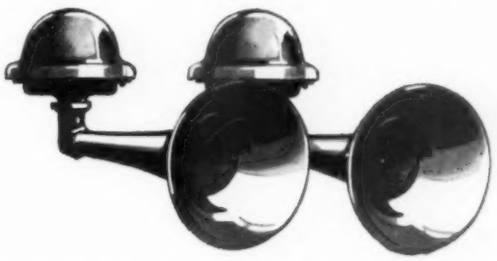

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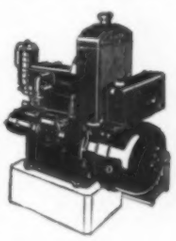

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The matter is also of importance on account of the fact that the ultimate check on the accuracy of workshop and inspection gages used in manufacturing practice is made by means of highly accurate reference gage blocks held within a tolerance of a few millionths of an inch per inch.

The recommendation adopted by the conference will be sent by the American Standards Association to all industrial groups concerned for written acceptance before final approval as an American Standard is given by the American Standards Association.

Extracts from Annual Reports

THE Harbor Defense Board has prepared revised projects for a number of harbor defenses embraced in the several coastal areas and I believe that the whole matter will be cleared up and necessary recommendations made to the War Department by January 1, 1933. The revised projects provide for the elimination of all guns and accessories now installed of questionable value, for the modernization of elements to be retained and for additional armament whenever deemed necessary. In the revised projects the maximum use is made of movable armament of all types and fixed installations are reduced to the minimum. When the harbor defense projects are finally approved considerable economies will be effected and the system of harbor defense which will result therefrom will be more flexible and, in my opinion, more efficient than the present system.—*Maj. Gen. John W. Gulick, Chief of Coast Artillery.*

TO give the required mobility for transport of machine gun components of the mechanized regiment, a vehicle possessing far more cross-country ability than that found in any wheeled vehicle is demanded. Much intensive study has been devoted to this problem by the chiefs of Cavalry and Ordnance. It is believed that a vehicle of the light truck type with half-track driving unit, now under study, offers much prospect of being the solution.

In any of the above types of vehicles, the question of giving them reasonable road mobility is easily solved. However, the problem of giving them not only sufficient cross-country ability but, as well, a flexibility that does not involve costly maintenance, is a matter of difficult solution. In a theatre of operations, vehicles of mechanical cavalry must of necessity operate off the roads a large proportion of the time. For this they must possess a high degree of dependable maneuverability, economically maintained, at reasonable speeds across country.

Sufficient funds are needed to procure the necessary vehicles for mechanized units, for extended test and establishment of a tactical doctrine for their employment.—*Maj. Gen. Guy V. Henry, Chief of Cavalry.*

THE number of radio sets authorized for the combat arms has increased to such an extent that the simultaneous operation of these sets in a field army appears impracticable. This conclusion is based on: (a) The lack of a sufficient number of channels to permit the simultaneous operation of more than a small fraction of the authorized number of sets without interference, and (b) The apparent impracticability of furnishing the necessary number of qualified radio operators within a reasonable time in an emergency.

The results of a study of this situation were submitted to the War Department, which announced the following policy restricting the number of radio sets: 1. Except for aircraft, mechanized forces and other rapidly moving units which are unable to install wire communication, only such numbers of radio sets will be authorized as are essential to provide the minimum instantaneous communication necessary. 2. All other units will depend primarily on wire circuits for electrical communication. Radio will be considered available for emergency use only. 3. The paralleling of wire circuits by radio channels will be considered abnormal. —*Maj. Gen. Irving J. Carr, Chief Signal Officer.*

AOA

Book Reviews

The Nation at War. By Gen. Peyton C. March, Chief of Staff of the United States Army in the World War. New York: Doubleday, Doran & Co., Inc. 1932.

IF John Galsworthy is correct, and he should be, the line of distinction between realism and romance is in the mood of the writer—the romanticist being bent on entertaining and the realist on interpreting or revealing. General March, considering all the comment one hears on nearly every side, certainly has not entertained with his memoirs of the American record in the World War. Squirming in one's chair while favorite idols are being made to shrink in stature and one great personality grows mightier is not entertainment of the most pleasing variety, hence this reviewer cannot nominate the General for a place in the hall of fame of romanticists. Beyond a doubt, though, "The Nation at War" abounds in revealing and interpreting. So its author, on the Galsworthy basis, is a realist of the first rank. Great generals must be realists and General March richly deserves both titles.

Unfortunately General March's book in its most important contribution to the American military record in the World War has been overshadowed by the storm of criticism it brought in its wake. It is so ruggedly outspoken, it offended so many admirers of personalities who are not handled with kid gloves, that much of the constructive function of the book has gone unnoticed. Leaving individuals out of the picture there are some subjects in the book which should not be overlooked.

The first is the seeming fallacy of establishing the strength of a division of troops in France at 40,000 men (27,000 combatant)—more than twice the size of the German, British and French divisions of 12,000 men. As General March says, "The reason for this decision was not apparent—and it could not be fairly assumed that they (the American generals and their staffs) were more competent to command a larger number of men than a British general or a French general." General Pershing does not give the reason in his two volumes of reminiscences and Colonel Palmer, author of Secretary Baker's official biography, states, "To the writer, who was much at headquarters in France, the reasons for the big division still remain obscure." Whatever the reasons one may comment that possibly in this cumbersome organization lay the cause of a great part of the supply difficulties which soon grew up in the munitions plants at home.

And it was General March's job to get the men and munitions to France. Transports making the ocean journey became ferries, the dead time at port was cut to a minimum and the program was carried out with an efficiency and determination which cast lasting credit on the Chief of Staff. One cannot help thinking none-the-less that if the American division had been normal in size the whole problem of computing requirements of munitions and in shipping them would have been far simpler.

Appropos of war debts—the decade-old complaint—General March in writing of the shipping difficulties says: "I told Bliss briefly that I would get over to France 90,000 men a month and more—the number of men instantly increased. During the month of March, 1918, this number leaped to 84,889. In April we shipped 116,642; in May, 245,945 and in June 278,664. By June 30th we had actually landed in France 897,000 men and had on the high seas, steaming toward France enough more to bring the figure of embarkation up to more than 1,000,000 men." Here's the strange commentary and the reason why the reviewer mentions war debts: General March says, "In the great troop movement abroad we

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carried 45 per cent of the men in our own ships; British ships carried 49 per cent; French 2 per cent; and Russian 1 per cent—and when I say carried I mean as paid passengers. In fact, the only contribution to our shipping program was the loan by Brazil of one ship for a definite time free of charge, and it was gladly accepted."

General March tells the story for the first time of the why and wherefore of our strange expeditions to Siberia and Archangel both of which from a purely military standpoint he considered neither practical nor practicable. Writing of a White House conference on the proposed Siberian expedition to which the United States was to contribute 7,000 men and Japan a like number, General March quotes President Wilson as saying to him (March): "You are opposed to this because you do not think Japan will limit herself to 7,000 men and this decision will further her schemes for territorial aggrandizement." To which General March replied, "Just that and for other military reasons which I have already told you." Later on he writes: "The expedition had scarcely landed when what I had predicted to the President took place—General Graves' first report disclosed 60,000 Japanese there and a later check-up indicated 72,000. Our force never exceeded the 7,000 limit of combatant troops within which we were pledged to remain."

Then there is the training of men for unduly long periods which the war-time Chief of Staff raps hard. Man power and its training with us is still the big fetish. We seem to forget what other generations of Americans have done in war. Where will the tactical conduct of the soldier be better shown than in our own Civil War and when were soldiers trained so little? We refer particularly to the ranks. With officers it was somewhat the same. Gen. John A. Rawlins, Grant's Chief of Staff, never saw a company of uniformed soldiers nor read a book on tactics or military organization before entering the Army in 1861. That does not mean that a reasonable amount of training of men and an adequate and permanent corps of trained officers are not essential. It does mean that war is always improvisation—improvisation of men and material. Plan and train we must but, after all, improvisation has its place and a very important one at that. General March has shown what a truly energetic mind can do in this regard. He improvised magnificently.

At the battle of Gettysburg the Northern Army came up from the South and the Southern Army came down from the North. In the World War there was an even greater mixing of labels. Familiarity with the industrial production of the sinews of war and how easily that production is disrupted by ill thought-out requirements, are facts that must be understood by all. General March's book will have performed its greatest service if, after the sores it has reopened are healed, it leaves an awakened understanding in the Army and out of it of the practical problems and delicate balance of men and munitions in war. But that such an objective will be achieved by the method of this book is problematical.

The Personal Memoirs of Joffre, Field Marshal of the French Army. Translated by Col. T. Bentley Mott. Appendices by Col. S. J. Lowe. New York: Harper & Bros. 1932. 2 Vols. $6.00.

THE theme of Marshal Joffre's Memoirs is found toward the end of his monumental work where he describes his visit to Mount Vernon in 1917. Standing in the shrine on the Potomac he read the framed bequest of Washington giving his three swords to his nephews: "These swords are accompanied with an injunction not to unsheath them for the purpose of shedding blood except it be for self defence or in defence of their country and its rights; and in the latter case to keep them unsheathed, and prefer falling with them in their hands to the relinquishment thereof." Writing in 1925 Marshal Joffre completes his memoirs with a kindred thought: "I wish to die sustained by the hope that France and

the United States will never forget that at two tragic moments in their history they drew their swords to fight side by side for right and liberty and did not sheathe them again until by a victory won together they had saved the most sacred of all causes."

The scope of the Memoirs covers principally a detailed narration of the activities of the Allied armies in 1914, 1915 and 1916, and gives as would be expected an account of the gigantic military operations of that period. The first is the "War of Movement" covering in detail the retreat of the Allied forces to the Marne—one of the twelve great battles of history—and then the historic battle ending with the impasse on the Western Front. The second is the "War of Stabilization" with special emphasis on the munitions problem. The third is the "Allied General Offensive in 1916" including Verdun, the Battle of the Somme and ending with the Marshal's resignation and his fruitful mission to America. The evidence here presented gives ample proof of the opinion of Frank H. Simonds that "Joffre was not only the greatest commander in chief of the World War, but also, as chief of a general staff, the superior of the elder Moltke himself." Joffre literally fought the civil administration for authority to mobilize the French Army when German mobilization was apparent. He ordered the use of shrapnel instead of high explosive shell to meet an ammunition shortage and forced the commercial manufacture of munitions when the civil administration contended that government plants had the required capacity—itself a lesson of no small import today. He shamed Field Marshal French into cooperation with other Allied troops and after much friction Joffre was responsible for keeping French in command after Kitchener had selected a sucessor. These and other incidents are told as they have not been told before.

On the side of great leadership the Marshal's Memoirs contain all the human emotions of the titanic struggle. How, when the crucial point of the German advance had been reached he commanded his troops to die at their posts, "No act of weakness can be tolerated;" how he rallied his men again and again and when Castelnau urged retreat behind the Meurthe, Joffre ordered "Do nothing of the kind. Wait twenty-four hours. You do not know how things are going with the enemy. He is probably no better off than you are." How he courtmartialed fifty generals for offenses ranging from incompetency to cowardice. Through it all is the great epic of the Marshal of France who assumed the entire burden of halting the first devastating German advance.

Colonel Mott's translation of these volumes is superb. Colonel Lowe who handled the appendices incorporates data on munitions supply and organization that are of exceptional importance both to an adequate reading of the Memoires themselves and to students of similar situations of the present and future. One cannot read these books and not be struck by the tremendous importance of munitions production and supply in the early days of a national emergency and in the decisive middle and last periods as well.

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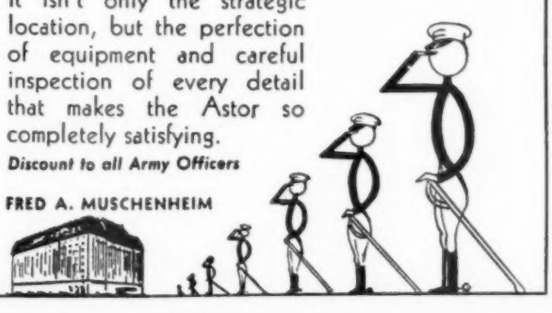

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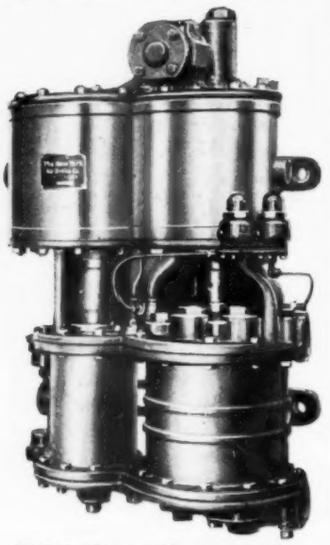

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